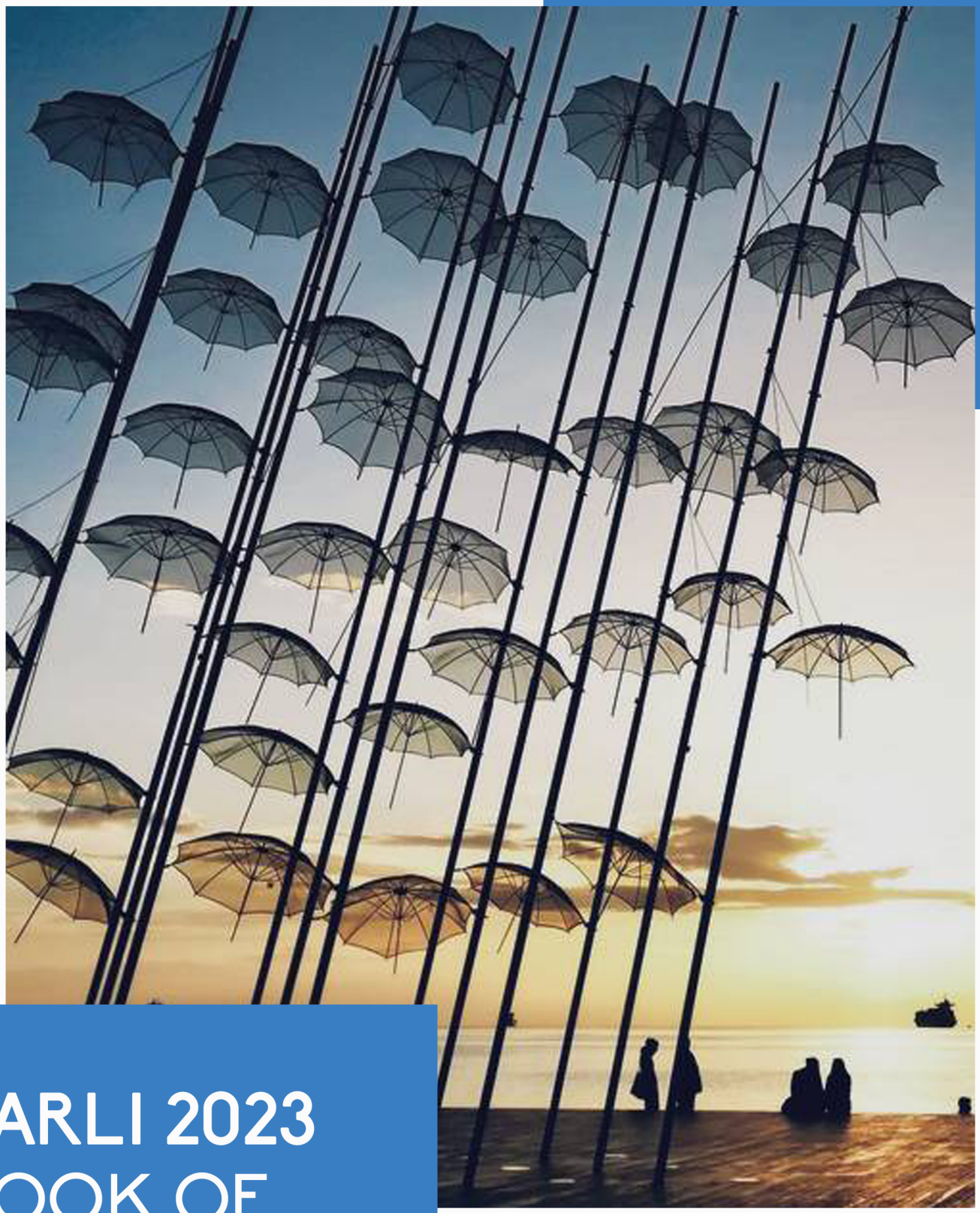

EARLI 2023 BOOK OF ABSTRACTS

EARLI 2023
The 20th Biennial EARLI Conference
for Research on Learning and Instruction
22 - 26 August 2023
Thessaloniki, Greece

EARLI.org/events/EARLI2023

Conference Annotations:

New sessions:

- D:28 - INVITED WORKSHOP: ACADEMIC PUBLISHING in room UOM_A08.

- I:26 - INVITED WORKSHOP: PUBLISHING IN LEARNING & INSTRUCTION: BECOMING A PRODUCTIVE RESEARCHER AND PUBLISHING AUTHOR in room UOM_A07.

- K:26 - INVITED PANEL: SUPPORTING TEACHING IN HIGHER EDUCATION: THE ROLE OF TEACHING AND LEARNING CENTERS AT TIMES OF CHANGE in room UOM_CH.

Policy Makers Session 1

22 August 2023 10:30 - 11:30
HELEXPO_CC
Policy Makers Panel

Learning and Instruction in the Digital Age: Challenges and Hopes for Education and Democracy

Keywords: Citizenship Education, Economics of Education, Educational Policy, School Leadership
Interest group:
Chairperson: Eleni Kyza, Cyprus University of Technology, Cyprus
Organiser: Eleftheria Gonida, Aristotle University of Thessaloniki, Greece
Organiser: Eleni Kyza, Cyprus University of Technology, Cyprus

This year's conference theme, "Education as a Hope in Uncertain Times", has been particularly chosen to signify the importance of education in helping societies across Europe, and the world, be resilient and resistant to significant existing or future challenges. In times of constant changes, the future is a moving target - difficult to predict and prepare for. Yet, education is doing just that. In order to think tomorrow's education and educational research, it is crucial to relate new findings to what we already know and elaborate how these will help foster sustainable learning processes and navigating what is yet to come.
EARLI recognizes the importance of dialogue between different societal stakeholders, with the scientific community and policy makers being two such important stakeholders. This panel seeks to bring to focus the importance of promoting productive exchanges between these stakeholders, and, along the way, understanding the unique contribution that each party can offer for the pursuit of common goals of societal and social importance.
- Andreas Demetriou, Cyprus Academy of Sciences, Letters, and Arts, Cyprus- Anantha Duraiappah, UNESCO Mahatma Gandhi Institute of Education for Peace and Sustainable development (MGIEP), India- Sanna Järvelä, University of Oulu, Finland - Roger Säljö, University of Gothenberg, Sweden- Andreas Schleicher, Director for Education and Skills, OECD

Learning and Instruction in the Digital Age: Challenges and Hopes for Education and Democracy
Presenting Author:ANDREAS DEMETRIOU, University of Nicosia and Cyprus Academy of Sciences, Letters, and Arts, Cyprus; **Presenting Author:**Anantha Duraiappah, UNESCOMGIEP, India; **Presenting Author:**Sanna Järvelä, University of Oulu, Finland; **Presenting Author:**Roger Saljo, University of Gothenburg, Sweden

This year's conference theme, "Education as a Hope in Uncertain Times", has been particularly chosen to signify the importance of education in helping societies across Europe, and the world, be resilient and resistant to significant existing or future challenges. In times of constant changes, the future is a moving target - difficult to predict and prepare for. Yet, education is doing just that. In order to think tomorrow's education and educational research, it is crucial to relate new findings to what we already know and elaborate how these will help foster sustainable learning processes and navigating what is yet to come.
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Session A 1

22 August 2023 12:15 - 13:45
AUTH_CH
Invited Symposium
Cognitive Science

Attention please! Real-world neuroscience investigations into attention with increasing naturalism.

Keywords: At-risk Students, Cognitive Development, Cognitive Skills and Processes, E-learning/ Online Learning, Educational Neuroscience, Educational Technologies, Mindsets, Mixed-method Research, Quantitative Methods, Synergies between Learning / Teaching and Research
Interest group: SIG 22 - Neuroscience and Education
Chairperson: Tieme Janssen, Vrije Universiteit Amsterdam, Netherlands
Organiser: Jennie Grammer, UCLA, United States
Organiser: Adi Korisky, Bar-Ilan University, Israel
Organiser: Pawel Matusz, Switzerland
Organiser: Tieme Janssen, Vrije Universiteit Amsterdam, Netherlands
Discussant: Nienke van Atteveldt, Vrije Universiteit Amsterdam, Netherlands

As the field of educational neuroscience has grown, questions have emerged regarding the ecological validity and applicability of lab-based research to educational practice. To address this issue, various approaches have been suggested to increase the ecological validity of neuroimaging experiments. One promising approach brings the real-world to the lab (representative design), while another approach brings the lab to the real-world using mobile neuroimaging technology. These approaches to real-world neuroscience are part of the three-stage cyclical model, covering a wide range of lab, semi-naturalistic and fully naturalistic studies, varying on ecological validity and experimental control. By iterating across stages and methods, it is possible to generate complementary and converging evidence that can address complex educational questions. In this symposium, four speakers will share their EEG research on attention, and each of the presentations will be situated on a different part of the cycle. We will begin with a carefully designed lab experiment into attentional control, which takes into account the complex multisensory reality and contextual factors that are important in everyday situations (representative design). This will be followed by increasingly more naturalistic studies into attention in online, in-person and classroom learning environments (mobile EEG). This unique symposium will be closed by our discussant, who will bring these studies together in the cyclical framework.

The context-dependence of neurocognitive attentional control functions
Presenting Author: Pawel Matusz, University of Applied Sciences Western Switzerland (HES-SO Valais-Wallis), Switzerland

We have learnt a lot about how we pay attention from studies using unisensory (e.g., visual) stimuli and manipulating observers' behavioral goals. However, everyday environments, including the classroom, are multisensory and contain regularities. Yet there is little systematic research on how attention is deployed in such complex settings, even in adults, with even less knowledge on development of attention therein. I will first discuss our study which revealed how children across primary education develop their abilities to pay attention to, traditionally studied, visual, and more naturalistic, multisensory (audiovisual, AV) objects - from the age at which those processes and their brain bases reach adult-like state to their role in shaping early scholastic skills. Next, I will discuss a study showing how in complex, naturalistic environments, adult's attention is jointly controlled by processes rarely studied altogether: AV salience-, goal- and context-based processes. Ability of visual distractors to capture attention depended on whether they were equipped with semantic relationships. In EEG, we found that, in such rich contexts, attentional selection is not implemented by the lateralized brain mechanisms traditionally linked to attention, but rather by nonlateralized ones. Crucially, contextual processes affected distractor processing already < 30ms post-stimulus. These findings indicate that, even if sensitivity to contextual processes undergoes development, attention in the classroom is controlled differently than in traditional lab contexts; classrooms are rich in multisensory, meaningful objects and event regularities. Thus, the contexts for studying cognitive processes key to learning, like attention, should at least emulate the contexts where learning naturally transpires.

Examining elementary school children's attention while learning online
Presenting Author: Jennie Grammer, UCLA, United States

Young children's attentional skills are important for their success in school. For children with Attention deficit/hyperactivity disorder (ADHD), the impact of inattention on educational outcomes is particularly pronounced. While the classroom environment presents an opportunity to support the development of children's attentional skills, little systematic research exists on which to base recommendations for practice. In addition, children's attention while learning online – which has become increasingly common since the Covid-19 pandemic – has yet to be thoroughly explored. Here we describe two studies in which we use real-world neuroscience methods, specifically portable electroencephalography (EEG) recordings, to examine elementary schooler's attention and distraction as they are learning online. We will demonstrate the impact of instruction on EEG and ERPs associated with attention and distraction for children with and without ADHD. We will also describe links between behavioral indicators of attention and neural correlates and discuss the implications of children's behavior for their interactions with teachers.

Are you listening to me? Attention in real-life classrooms
Presenting Author: Elana Zion Golumbic, Bar Ilan University, Israel; **Co-Author:**Adi Korisky, Bar-Ilan University, Israel

Paying attention to a classroom lesson is hard. Students are required to maintain a constantly high level of attention towards the teachers' lessons in order to process and internalize its content. All the while, students need to avoid becoming distracted, either by external stimuli (e.g., sounds from outside, other students talking) or by their own internal thoughts (e.g. boredom, mind-wandering). In this talk, we describe a unique research–practice partnership between cognitive neuroscientists and educators aimed at understanding the cognitive and neural underpinnings paying attention in real-life school. Using mobile EEG technology, we study how students respond to different types of distracting events, both in both well-validated cognitive tasks and in real-life classroom experiments. Working together with teachers, this unique research approach allows us to gain a more ecologically-relevant perspective on students' attention, as it pertains to their real-life experiences and how it affects learning outcomes.

Mobile EEG neurofeedback to convince high school students of the controllable nature of their brain
Presenting Author: Tieme Janssen, Vrije Universiteit Amsterdam, Netherlands

Although past research demonstrated growth mindset interventions to improve school outcomes, effects were small. This may be due to the theoretical nature of psychosocial techniques (e.g., reading about brain plasticity), which may not be optimally convincing for students. To address this issue and improve effectiveness, we developed a growth mindset intervention, which combined psychosocial (3 lessons) and psychophysiological (1 lesson) components. The latter adds a convincing experience of influencing one's own brain activity related to attention, using mobile electroencephalography (EEG) theta/beta neurofeedback (NFB), emphasizing the controllable and malleable nature of one's brain. In this randomized controlled trial (RCT), twenty high school classes (N=439) were randomized to either the active control or our newly developed growth mindset intervention condition (4x50 minute lessons). First, the NFB results showed that students were able to control their brain activity, and that objective and subjective control were differently related to motivational beliefs at baseline. Second, the overall RCT results showed that students in the growth mindset intervention reported increased growth mindset directly after the intervention (post, d = 0.38) and at 1-year follow-up (d = 0.25), and demonstrated a protective effect against deterioration of math grades at 1-year follow-up (d = 0.36), compared to controls. Compared to previous studies, we found relatively large effects of our intervention on growth mindset and math grades, which may be attributable to synergetic effects of psychosocial and psychophysiological (neurofeedback) components.

Session A 2

22 August 2023 12:15 - 13:45
UOM_CH
Invited Symposium

'Hope' for disadvantaged students: Extended Education in a Global Perspective

Keywords: At-risk Students, Cultural Diversity in School, Informal Learning, Migrant / Refugee and Minority students, Qualitative Methods
Interest group: SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Nanine Lilla, Freie Universität Berlin, Germany
Organiser: Nanine Lilla, Freie Universität Berlin, Germany
Organiser: Marianne Schuepbach, Freie Universität Berlin, Germany
Organiser: Ingrid Gogolin, University of Hamburg, Germany
Organiser: Liesel Ebersöhn, Unit for Education Research in AIDS, South Africa
Discussant: David Thore Gravesen, Denmark
Discussant: Ioulia Televantou, European University Cyprus, Cyprus

The proposed symposium focuses on the role of extended education in addressing the challenges of societal changes including family changes and increased complexity of educational processes at times of global change and uncertainty. Forms of extended education are being explored in numerous nations around the world. Examples are extended education offerings as "All-day schools" in Germany, "Outside school hours care" in Australia or "Out-of-school time" in UK. These approaches have been designed to promote the development of school-age children and youth supplementing formal education. They aim in particular to offer a means to support students who are educationally disadvantaged, e.g. because of their socio-economic background or due to cultural or linguistic characteristics. Meta-analyses of US studies show that non-formal education can be successful in promoting disadvantaged students in their academic achievement or social skills. However, other studies show that it is precisely the target group of the particularly disadvantaged pupils that does not benefit from the offerings as desired. The symposium presents empirical papers that will give insights into the ambiguous state of evidence from the perspective of studies from different education systems around the globe.

Educational quality of extended education in Germany with a focus on disadvantaged students
Presenting Author: Jule Schmidt, Freie Universität Berlin, Germany; **Co-Author:**Haiqin Ning, Freie Universität Berlin, Germany; **Co-Author:**Nanine Lilla, Freie Universität Berlin, Germany; **Co-Author:**Marianne Schuepbach, Freie Universität Berlin, Germany

The nationwide expansion of all-day primary schools in Germany is associated with the expectation of strengthening educational success and social participation, especially for socially and educationally disadvantaged students with migration backgrounds (Abbrev. TG) (KMK, 2015). However, these expectations for all-day schools have not been adequately fulfilled in Germany (StEG-Konsortium, 2016). In other countries, however, there are comparable high-quality offerings of extended education that are effective (Durlak et al., 2010; Lauer et al., 2006). Furthermore, international research identifies educational

quality (Tietze et al., 2005) as an important condition for effective offerings (Stecher et al., 2007; Durlak et al., 2010). Based on this, this article deals with two questions: 1) What are characteristics of educational quality in extended education effective for the TG? 2) How is the conception of the current offerings at German all-day primary schools to be assessed in this respect? Fifteen problem-centered interviews according to Witzel (2000) were conducted online with international extended education researchers from all over the world. The data analysis follows the process model of structuring qualitative content analysis according to Mayring (2014) and Kuckartz (2018), supported by MAXQDA (Kuckartz, 2018).Initial explorations of the interview material reveal relevant characteristics of educational quality at structural, process, and orientation quality levels. Regarding the development of the TG, the current qualification of the staff as well as the decreasing cooperation between schools and external partners are predominantly critically discussed, while the orientation towards an inclusive learning environment is evaluated as purposeful.

The role of background characteristics for participation in all-day schooling in Germany
Presenting Author: Luise Krejcik, Universität Hamburg, Germany; **Co-Author:**Ingrid Gogolin, University of Hamburg, Germany

In many education systems around the world, students from socially disadvantaged migrant families or autochthonous minorities have particularly poor educational opportunities. One measure to compensate for educational disadvantages and raise achievement as hope in uncertain times is to provide additional education and care services. In Germany, these are provided especially in newly introduced all-day schools. Internationally, they are discussed under "extended education". Research shows that in some countries these offers provide the expected compensation for disadvantages, but in others - e.g. Germany - they do not. This article presents interim results of an investigation into the possible reasons for this. The focus is on the question of correlations between students' characteristics of origin and their participation in extended education.

The Conundrum of OSHC services in Australia
Presenting Author: Jennifer Cartmel, Griffith University, Australia; **Co-Author:**Bruce Hurst, University of Melbourne, Australia

Outside school hours care (OSHC) is a significant site of care, play and learning for children aged five to twelve years in Australia. The growth of services mirrors international trends. The growth of services also has the potential to support the development and wellbeing of children when its value as a site of play and learning is recognised. expectations of children, families and the wider community. Using a review of academic and grey literature evidence was gathered that suggests that quality OSHC provision for children in an interplay between the following elements: 1. The benefits of OSHC to stakeholders 2. The image of OSHC 3. The partnership between OSHC and schools 4. The workforce delivering OSHC service. This review of Australian literature also highlights the conundrum of equitable and inclusive access for Australian children. Recommendations highlight the need for more research about the OSHC as a site for children’s development and the partnerships between OSHC, schools and families. In particular children from vulnerable circumstances such as those at risk of abuse or neglect, of working sole parents and families requiring additional support to help raise their children appeared to have limited access. The review advocates for a deeper understanding about the value of OSHC to enhance community perceptions and commitment to the utilisation of services to contribute to children’s wellbeing and development.

Why young people in high-poverty contexts choose not to participate in Out-of-School Time provision
Presenting Author: Kirstin Kerr, University of Manchester, United Kingdom; **Co-Author:**Claire Forbes, University of Manchester, United Kingdom

Out-of-School Time (OST) provision offers young people opportunities to participate in a variety professionally-supervised sports, leisure, cultural and academic activities, which aim to promote affective and academic outcomes. While young people from high poverty contexts are widely seen as having most to gain from OST, their participation is typically low, even when activities are easily accessible at little or no cost. Little is known from young people’s perspectives about why this is. Addressing this gap, this paper will report findings from a qualitative study with young people (aged 11-15) living in Hollyburgh, a high-poverty neighbourhood in the UK, with wide-ranging but under-used OST provision. Findings suggest that young people were unwilling to participate in Hollyburgh’s current OST provision, primarily seeing this as a form of professional surveillance to control their behaviour after school. This belief stemmed from young people’s generally negative perceptions of Hollyburgh as a place characterised by crime and anti-social behaviours. We argue that if participation is to be encouraged in places like Hollyburgh, OST provision must been seen as having the potential to interrupt negative discourses about high poverty neighbourhoods and the young people who live in them. Unless it can do so, these discourses may continue to play out in OST provision, leading to young people’s non-participation. We argue that to address this OST provision must first be understood as a contextual and relational activity, and second, OST providers and young people must have opportunities to work together to co-design and -lead activities.

Session A 3

22 August 2023 12:15 - 13:45
UOM_A03
Symposium
Learning and Special Education

New procedure to assess Executive Function and predict learning outcome in Special Educational Needs

Keywords: Assessment Methods, Cognitive Development, Cognitive Skills and Processes, Learning and Developmental Difficulties, Social Development, Special Education
Interest group: SIG 15 - Special Educational Needs
Chairperson: Chiara Pecini, University of Florence, Italy
Discussant: Pirjo Aunio, University of Helsinki, Finland

Executive Functions (EF), defined as multiple cognitive control processes for learning and adaptation (Diamond, 2013), are frequently impaired in children with Special Educational Needs (SEN), thus contributing to develop poor learning skills (Crisci et al., 2021). Nowadays, different tools and procedures can be used to test EF in infancy and childhood, that are known to be the most sensible periods for EF development. Nevertheless, the characteristics of the models and tools used (e.g. direct vs indirect; paper and pencil vs digital; in presence vs remote) may affect the EF profile that is found and its relationship with the learning outcome across different types of SEN.The symposium consists of four papers tapping different ages and needs. The first contribution shows that EF precursors can be assessed by an infant and toddler development scale including early term infants. The second study refers to a tablet-based EF assessment of blind and deaf children. In the third study, EF is investigated in children with attentional problems and/or learning disability in different contexts of quiet and noise. The fourth contribution shows the use of EF tele-assessment in low and high comprehenders/writers from primary school. All contributions relate the findings on the EF profiles with the learning skills and cognitive development of a specific SEN population. Strengths and weakness of the different procedures will be discussed to promote a better understanding of the role of EF difficulties in learning and adaptation across different SEN.

The development of Executive Functions with early term toddlers from families with social burdens
Presenting Author: Minna Törmänen, University of Teacher Education in Special Needs Zurich, Switzerland; University of Helsinki, Finland, Switzerland; **Co-Author:**Simone Schaub, University of Teacher Education in Special Needs, Switzerland; **Co-Author:**Erich Ramseier, PH Bern, University of Teacher Education, Berne, Switzerland; **Co-Author:**Christina Koch, University of Teacher Education in Special Needs, Zurich, Switzerland; **Co-Author:**Alex Neuhauser, University of Applied Sciences of Special Needs Education, Switzerland; **Co-Author:**Isabelle Kalkusch, University of Teacher Education in Special Needs, Zurich, Switzerland; **Co-Author:**Patsawee Rodcharoen, University of Teacher Education in Special Needs, Zurich, Switzerland & University of Bern, Switzerland; **Co-Author:**Andrea Lanfranchi, University of Applied Sciences of Special Needs Education, Switzerland

The development of Executive Functions (EF) in infants and toddlers has received increased interest. Children born prematurely are biologically immature and are at-risk of developmental difficulties and executive deficits. Early term births have increased rapidly, and they predispose to developmental delays and disabilities. EF is an umbrella term for heterogeneous, higher-order cognitive processes that are important for active regulation of thought, emotion, and adaptive behavior. EF are very sensitive to environmental factors including negative ones, such as poverty, and positive ones, such as sensitive parenting.ZEPPELIN (Zurich Equity Prevention Project with Parents’ Participation and Integration) is a longitudinal intervention study (RCT) conducted with

families (N=248) having social burdens, like social, financial and/or psychological risk factors. It aims to study weather early support has positive impacts on children's development, educational opportunities and later on their academic achievements, and parents show improved parenting practices.The aim of this study is to describe EF development in children with early term (N=69) and on term births (N=163) between 0 and 3 years. Main method is Bayley Scales of Infant and Toddler Development (BSID-III, 2006). There is lack of EF measurements for toddlers and situation is more complicated with children having early term birth. We hypothesized that BSID-III contains items with EF components.According to our results it was possible to extrapolate EF components from BSID-III in longitudinal manner. However, concerning the development of different EF components results were contradictory.

Executive functions in blind and deaf children: a Tablet-based assessment
Presenting Author: Camila Martinez, Pontificia Universidad Católica de Chile, CIE 160007, Chile; **Co-Author:**María Victoria Espinoza,, Centre for Educational Justice at the Pontifical Catholic University of Chile., Chile; **Co-Author:**Catalina Santa Cruz, Centre for Educational Justice at the Pontifical Catholic University of Chile., Chile; **Co-Author:**Ricardo Rosas Diaz, CEDEti-UC, Chile

Executive functions are of the highest interest because of their relationship with learning, in general, and specifically with reading and math. We hereby present the development of the YellowRed App, a Tablet-based test to assess Executive Functions (EF) in deaf and blind children. YellowRed was developed to assess the three main EF components (inhibition, working memory and cognitive flexibility) in typically developing children, as well as children with special educational needs, from 6 to 12 years of age. Additionally, as EF impairments could be associated with learning problems in deaf or blind children, two YellowRed versions adapted to these populations were developed. We present the results of a pilot study performed in blind and deaf children by using the adapted YellowRed App. The results support the usefulness of assessing EF in deaf and blind children by a tool that resembles that one for typically developing children, thus allowing for a direct comparison between different developmental circumstances.

Assessing inattentive children's executive functioning in quiet and noise
Presenting Author: Barbara Arfé, University of Padova, Italy; **Co-Author:**Gaia Spiacciarelli, Human Inspired Technology Centre, University of Padova, Italy; **Co-Author:**Chiara Montuori, Human Inspired Technology Centre, University of Padova, Italy; **Co-Author:**Flavia gheller, School of Psychology, University of Padova, Italy, Italy

Children with attentional problems associated with a learning disability (LD) or attention deficit hyperactivity disorder (ADHD) have greater difficulties in self-regulating and sustaining their attention during academic tasks. In educational and clinical settings, their executive function (e.g., sustained attention and verbal working memory) are typically assessed in individual testing sessions under optimal environmental conditions, i.e., in quiet. In real life, however, children are often asked to perform attentional and memory tasks in noisy classrooms. The study explored how inattentive and attentive children's sustained attention and working memory performance are influenced by babble noise, a type of noise frequently associated with classroom activities. Fifty-eight typically developing children and 13, 8 to 12 years-old, children with either attentional problems associated to LD or ADHD (n= 10) or performance 2 SD below the mean on standardized attention tasks (n= 3) completed two visual attention tasks and a verbal WM task (digit span) on tablet, under two acoustic conditions: quiet and 65dB multitalker-babble noise. Significant differences between the groups were found on both visual attention tasks and the verbal WM (digit forward and backward) task in quiet, but not in noise. In the group with attentional problems, sustained attention abilities improved significantly in noise. These findings will be discussed in the light of the stochastic resonance hypothesis, according to which background noise could ameliorate inattentive children's performance, increasing their arousal on task.

Paper and digital learnings in low and high performers: the involvement of Executive Functions
Presenting Author: Costanza Ruffini, University of Florence, Italy; **Co-Author:**Christian Tarchi, University of Florence, Italy; **Co-Author:**Chiara Pecini, University of Florence, Italy

Literature supports a disadvantage of students' performances when learning tasks are conducted in the digital modality in comparison to the paper one. The present research aims to investigate the difference between digital and paper text comprehension (TC) and text writing (TW), placing a specific focus on Executive Functions (EF) role as mediator factors of the performances. 175 typically developing children (mean age=9.75, sd=.89) performed TC and TW tasks on computer and on paper and were assessed with digital EF tasks. The results showed no differences between digital and paper TC in the whole sample; however, Low Comprehenders (LC) children obtained higher TC scores in the digital than in the paper modality, an opposite trend to High Comprehenders (HC) with differences that tended to decrease with school grade. EF, especially working memory, supported digital and paper TC. For what concerns TW, productions were longer and less complex in the digital modality than in the paper one. Low Writers (LW), in opposition to High Writers (HW) showed an advantage of digital over paper in the level of narrative complexity and in the number of words, although the latter interacted with school grade. EF, especially processes of updating and switching of interference control, supported both paper and digital writing skills. The results support the utility of the technological devices for children with low learning skills, but they also highlighted the need to consider the child's individual functional profile, both in terms of cognitive control processes and learning performance level.

Session A 4

22 August 2023 12:15 - 13:45
AUTH_DC3
Symposium
Motivational, Social and Affective Processes

Theoretical or methodological perspective on process-oriented research of motivation and emotion

Keywords: Assessment Methods, Cooperative/Collaborative Learning, Emotion and Affect, Health-care Education, Mixed-method Research, Motivation, Quantitative Methods, Self-regulated Learning and Behaviour, Social Interaction
Interest group: SIG 27 - Online Measures of Learning Processes
Chairperson: Tiina Susanna Törmänen, University of Oulu, Finland
Organiser: Hanna Jarvenoja, University of Oulu, Finland
Discussant: Roger Azevedo, University of Central Florida, United States

An increasing number of learning researchers are collecting and analyzing data implementing various on-line process methods. This trend to implement more various methods align well with interest to understand motivation and emotions as varying across contexts, situations and learning processes. However, the endeavor for more versatile approaches in research on motivation and emotions leads to reconsidering some basic premises. On one hand, when implementing on-line measures to study motivation and/or emotions as a part of a learning process, it is essential that the methodological and analytical choices are considered from their underlying theoretical perspectives. This strong theoretical basis provides premises for considering the novel methodological and analytical choices. On the other hand, new methods and approaches provide means for challenging the current theories and approaches. For example, the continuous and fine-grained data enable new types of temporal and sequential analyses as well as person- or group-centered approaches, which can broaden the current understanding of motivation and emotions and their role in a learning process.
The aim of this symposium is to have an overview on a set of researches that approach the motivation and/or emotion research primarily on one perspective but regardless implement different on-line measures (e.g., ESM, video recordings or biophysiological data) and engage in considering the relation between the implemented theory and methodology. Through four presentations, each having their own theoretical and methodological premises the underlying questions, the different conceptual issues and their consequences for the empirical decisions are addressed and discussed.

Theoretical Challenges for Motivational Regulation revisited: Data Granularity and Time Frame
Presenting Author: Thomas Martens, Medical School Hamburg, Germany; **Co-Author:**Moritz Niemann, MSH Medical School Hamburg, Germany; **Co-Author:**Diana Pistoll, Medical School Hamburg, Germany

Motivational processes and regulation, especially in the framework of self-regulated learning were primarily investigated by questionnaires. New data sources

with different data granularities representing different time frames can be triangulated to understand motivational processes in a specific learning situation: e.g. observation data, trace data, physiological data or even self-report data like thinking aloud or experience sampling can be used. We argue that interpretation of these data should be guided by strong theoretical models.For this purpose, three different time frames are defined: A micro-level time frame that describes direct learning processes that are associated with solving problems and resolution of confusion. These processes may last for seconds or minutes. A meso-level time frame that reflects processes that are described by most theories of self-regulated learning. These processes may last for minutes, hours, even days or weeks. The macro-level time frame comprises processes that develop over months or years usually covered by personality theories. All three time frames are covered by multiple theories, but the theoretical gap remains: how can these three different time frames be connected? It can be theorized that two major processes may connect these time frames:(a) An internalization process from micro- to meso- to macro-level.(b) A motivation regulation mechanism from macro- to meso- to micro-level.Different data sources with different granularities can roughly be associated to the three defined time frames. Empirical examples from different studies will illustrate how to connect data from different time frames to better understand motivational regulation.

Paradigmatic shifts in theory and methods regarding short-term motivational & emotional processes
Presenting Author: Julia Moeller, Universität Leipzig, Germany; **Co-Author:**Julia Dietrich, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Jessica Baars, Leipzig University, Germany; **Co-Author:**Miriam Jähne, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Lennart Nörenberg, Universität Leipzig, Germany

In-the-moment measures of emotions and motivation in learning and achievement settings become increasingly ubiquitous, cheap and easy to obtain and analyze. The increasing availability of such data is expected to drive paradigmatic changes to both the theory and empirical research of emotions and motivation. Regarding theory development, we face the interesting situation in which methodological advancement seems to be driving theoretical change, rather than usually expected theories determining the research methods. To make the most of the innovations in intensive longitudinal methods and describe short-term developmental processes, theories need to become more specific than before about expectations regarding moment-to-moment stability and change, inter-individual differences in within-person trajectories, person-specific stability and change across many measurement time points, ergodicity or the lack thereof, and concurrent and lagged relationships among motivational and emotional constructs in time series data. With regard to the research methods, we expect the process character of emotional and motivational experiences to become more of a research focus particularly in research on learning, which is by definition a process of change. We see a steady increase of intensive longitudinal studies and much innovation in analytic approaches, including studies of moment-to-moment stability and change, within-person idiographic patterns and their subsequent generalization to nomothetic models based on machine learning procedures used to identify the paths and trajectories that generalize across individuals (e.g., Beltz et al., 2016). We will discuss how these and further paradigmatic shifts are expected to shape the theory and methods of emotional and motivational processes in the near future.

Multilayered perspective on Motivation and Emotion Regulation in Collaborative Learning
Presenting Author: Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:**Tiina Susanna Törmänen, University of Oulu, Finland; **Co-Author:**Tatiana Shubina, University of Oulu, Finland, Finland; **Co-Author:**Kristiina Mänty, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland

In this presentation, we frame the theoretical underpinnings of the process-oriented research of motivation and emotion regulation in collaborative learning contexts. Self-regulated learning theories provide the theoretical grounding for considering the motivation and emotions related to learning in groups. We define the types of regulation present in collaborative learning contexts—namely, self-, co-, and socially shared regulation—and the role of motivation and emotion regulation in them. Then, we elaborate on the function of motivation and emotions in social forms of regulation. We focus on (1) motivational and emotional conditions, (2) situational and contextual variations, and (3) the temporal manifestation of regulation in interaction. Prior studies have indicated that although the occurrence of co- and socially shared regulation of motivation and emotions is relatively rare, they are meaningful to group collaboration. Groups can activate socially shared regulation throughout the collaborative learning process to establish a stage for high-level cognitive processes. Our claim is that motivation and emotions are integral parts of social and cognitive functioning and should be studied in relation to the situation, context and other group processes.

Examining Medical Residents' Physiological Synchrony During Crisis Simulation Training
Presenting Author: Jason Harley, McGill University, Canada; **Co-Author:**Lucia Patino, McGill University, Canada; **Co-Author:**Matthew Moreno, McGill University, Canada; **Co-Author:**Keerat Grewal, McGill University, Canada; **Co-Author:**Sayed Azher, McGill University, Canada; **Co-Author:**Negar Matin, McGill University, Canada

Medical training is emotionally demanding yet, trainees' emotions are rarely addressed in curriculums. Emotions can facilitate or hinder learning, thus Crisis Resource Management (CRM) simulated training has been incorporated into medical curriculums to facilitate the development of medical residents' intrapersonal and interpersonal skills necessary to function within collaborative medical teams during crisis situations, when emotional demands increase. Electrodermal activity (EDA) is a signal used as index of emotion measuring autonomic physiological arousal as a response to emotional stimuli. Physiological synchrony (PS), the spontaneous similarities over time in individuals' physiological responses such as EDA, has been linked to collaboration, learning quality, and performance. However, there is a paucity of research in medical education examining PS as a predictor of cohesion, and performance, despite the importance of these emotional qualities in medical teams. We therefore aim to examine the presence of PS in medical residents as they undergo CRM simulation training. We observed thirty-seven second year medical residents in ten groups ranging from 3 to 6 participants each, during CRM scenarios. Participants' EDA was captured using Empatica E4 wristbands, and simulation sessions were videotaped. EDA signals are being pre-processed, standardized, and synchronized with the video. A Multidimensional Recurrence Quantification Analysis will be conducted to determine the presence of PS and its characteristics.Our research will explore the presence of PS during collaborative learning tasks in medical residents and provide novel scientific insights into group emotional dynamics, particularly in the context of simulation-based medical education.

Session A 5

22 August 2023 12:15 - 13:45
AUTH_DC1
Symposium
Motivational, Social and Affective Processes

Goals, Reasons, and Complexes: Current Advances in Achievement Goal Research

Keywords: Goal Orientations, Motivation, Self-determination, Self-regulated Learning and Behaviour
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Martin Daumiller, University of Augsburg, Germany
Chairperson: Marc Philipp Janson, University of Mannheim, Germany
Discussant: Ruth Butler, Hebrew University of Jerusalem, Israel

The achievement goal approach is a particularly prominent and productive approach to the study of achievement motivation. Rooted in the works by Dweck, Nicholls, Ames et al. in the 1980s, much has been learned about characteristics, antecedents, and consequences of goal pursuit. Achievement goal research is still ongoing, with multiple recent theoretical developments and accompanying empirical realizations, including reasons behind goals, goal complexes, equifinality and multifinality, and joint goal pursuit. Addressing these current trends, this symposium consists of four papers that complement each other by combining different theoretical perspectives, methodological approaches, and data from multiple international samples. Paper 1 provides a novel perspective on achievement goals and regulatory foci, extending their fundamental linkage beyond goal valence (approach-avoidance dimension) towards underlying self-guides of ideals and oughts. Paper 2 investigates how achievement goals are linked with multiple underlying reasons, and examines consequences and personal predictors of these linkages. Paper 3 addresses underlying reasons of achievement goals by testing their relation to challenge-seeking and procrastination in a longitudinal design. Finally, Paper 4 presents results of an experiment on the interplay of goal complexes and feedback on learning processes and outcomes. All contributions are characterized by the aspiration to dive deeper into what drives achievement goal pursuit, and in doing so

contribute to both theory and practice. This provides better understanding of how different perspectives on and developments within goal research align, and how exactly goals motivate human behavior. A leading achievement goal scholar will critically discuss the presentations and directions for future research.

Beyond Approach-Avoidance: Achievement Goals, Regulatory Foci, and Self-Guides
Presenting Author: Sophie Bossert, University of Mannheim, Germany; **Co-Author:**Marc Philipp Janson, University of Mannheim, Germany

Achievement goal theory and regulatory focus theory are two prominent approaches explaining individual goal striving. Achievement goal theory states that individuals prefer different qualities of goals in achievement situations such as developing competence (mastery goals) versus demonstrating competence (performance goals). Both achievement goals can be subdivided into approach and avoidance. Regulatory focus theory proposes two motivational systems. A promotion focus emphasizes striving for reaching positive outcomes like hopes, wishes, and aspirations (ideals), while a prevention focus emphasizes striving for not failing on negative outcomes, duties, responsibilities, and obligations (oughts). Recent research has connected both constructs mainly based on the approach-avoidance distinction which is central to both theories. We see this as a theoretical as well as a methodological shortcoming and propose a different theoretically meaningful association of those constructs. Based on theoretical considerations of the underlying processes and existing studies on correlates, we propose that performance goals (approach and avoidance) are associated with a prevention focus, and mastery goals are associated with a promotion focus. We provide cross-sectional data from N = 192 German university students as first empirical support and designed an experiment manipulating regulatory focus and measuring achievement goals for this registered report. We expand research on the nomological network of both constructs with our perspective and contribute to a deeper understanding of human strategic orientations. We also provide opportunities for the development of improved goal fostering interventions in achievement situations.

Do Perfectionistic Tendencies Moderate the Effect of Goals and Goal Reasons on Academic Well-being?
Presenting Author: Markku Niemivirta, University of Eastern Finland, Finland; **Co-Author:**Antti Pulkka, National Defence University, Finland; **Co-Author:**Anna Tapola, University of Helsinki, Finland; **Co-Author:**Heta Tuominen, University of Eastern Finland, Finland

In this study, we looked at the role of goals in student motivation and well-being in combination of various perspectives. More specifically, we investigated how achievement goals and reasons for those goals (utility, indication of competence, gaining respect, personal importance, promotion of self-worth) link with each other, how they jointly predict study-related engagement and exhaustion, and whether these connections vary depending on what the students expect from themselves and how concerned they are about their accomplishments (i.e., perfectionistic tendencies). Through latent profile analysis, we identified three groups of Finnish university students (N = 305) with different perfectionistic profiles, perfectionists (high strivings and concerns; 31.8 %), ambitious (high strivings, low concerns; 40.7 %), and non-perfectionists (low strivings and concerns; 27.5 %), which also differed systematically in terms of the achievement goals and goal reasons they emphasised. Interestingly, reasons for goals predicted academic well-being above and beyond the effects of goals, and the predictions were for the most part rather similar across the perfectionistic profiles. The differential effects between the groups observed, however, revealed that the experiences of strain in studies might be more dictated by how the students approach their goals and attainments. Our complex set of results provide new insights into the dynamics of achievement goals and the linkage between motivation and well-being.

Autonomous Reasons Underlying Achievement Goals and Challenge-seeking, Procrastination, and Grades
Presenting Author: Athanasios Mouratidis, National and Kapodistrian University of Athens, Greece; **Co-Author:**Aikaterini Michou, University of Ioannina, Greece; **Co-Author:**Aysenur Alp, University of Zurich, Switzerland; **Co-Author:**Aylin Kocak, Izmir University of Economics, Turkiye; **Co-Author:**Şule Selçuk, University of Kastamonu, Turkiye

More and more empirical research has started testing the theoretically attractive proposition of examining the reasons for which students endorse specific achievement goals. Yet, most of these studies rely on cross-sectional data. In this two-wave study, we build on the accumulated evidence by investigating to what extent autonomous and controlling reasons underlying the pursuit of mastery and performance-approach goals predict changes in challenge-seeking, procrastination, and grades among adolescent students. Participants were 1,336 Turkish adolescent students (M_{age} = 15.52, SD = 0.39 years; 63.5% females).

They filled out a survey in the Fall semester (T1) where they reported autonomous and controlling reasons underlying mastery and performance-approach goals for either mathematics or Turkish language, their preference to seek challenges, and their tendency to procrastinate their homework in that subject. Six months later (T2), they reported their challenge-seeking and procrastination again, and at the end of the school year their grades in that subject. Path model analyses showed that, after controlling for autoregressive effects, autonomous reasons unergirding mastery-approach and performance-approach goals predicted T2 challenge-seeking, which positively predicted end-year subject-matter grades. Also, autonomous reasons underlying mastery-approach goals negatively predicted T2 procrastination, which negatively predicted end-year subject-matter grades. The latter was also directly predicted positively by autonomous reasons and negatively by controlling reasons underlying mastery-approach goals. These findings provide further empirical evidence for the adaptive role that autonomous reasons could play in achievement striving. The limitations of the study and suggestions for future research are discussed accordingly.

You did well! Does Feedback Independently of or Interactively with Goal Complexes Affect Outcomes?
Presenting Author: Aikaterini Michou, University of Ioannina, Greece; **Co-Author:**Servet Altan, MEF University, Turkiye; **Co-Author:**Athanasios Mouratidis, National and Kapodistrian University of Athens, Greece; **Co-Author:**Maarten Vansteenkiste, Ghent University, Belgium; **Co-Author:**Caroline Pulfrey, Swiss Federal Institute of Technology, Switzerland

Experimental studies have shown that mastery and performance goals communicated in an autonomy-supportive style facilitate goal endorsement for autonomous reasons leading to positive outcomes. In the present experimental study, we extended this line of research by investigating whether positive or negative feedback after task completion could attenuate the effect of autonomy-supportive style or achievement goals or their interaction on task takers' interest, task value, pressure, and perceived competence. Following the Goal Complex perspective, we conducted a two (mastery vs. performance goals) by two (autonomy-supportive vs. controlling style) by two (positive vs. negative feedback) experimental study in which conditions were induced through language (i.e., semantically) and voice tone. The sample consisted of 175 middle school Turkish students (51.4% males; M_{age} = 12.67, SD = 1.4), who performed two emotion recognition tasks (ERTs) participating randomly in one of the eight conditions. Factorial ANOVA showed that feedback interacted neither with the autonomy-supportive style of achievement goal promotion nor with the achievement goal in the prediction of task outcomes. Participants in the autonomy-supportive conditions reported higher interest and task value than those in the controlling conditions. Performance (against mastery) goal conditions increased task value only after feedback was introduced, but they also increased pressure. Lower task value was observed in the mastery-controlling condition than in all the others. Finally, positive feedback predicted only perceived competence. The findings speak for the importance of autonomy-supportive style in achievement goal promotion to facilitate their endorsement for autonomous reasons and enhance positive outcomes.

Session A 6

22 August 2023 12:15 - 13:45
UOM_A06
Symposium
Culture, Morality, Religion and Education

Determinants of school success for immigrant children

Keywords: Cultural Diversity in School, Developmental Processes, Educational Attainment, Foreign and Second Language Acquisition, Migrant / Refugee and Minority students, Multicultural Education, Primary Education, Quantitative Methods, Reading
Interest group: SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Sebastian Nicolas Thomas Vogel, TU Dortmund University, Germany
Organiser: Justine Stang-Rabrig, TU Dortmund University, Germany
Organiser: Nele McElvany, TU Dortmund University, Germany
Discussant: FROSSO MOTTI, National and Kapodistrian University of Athens, Greece

Immigrant students often face challenges in school that can hinder school success. Global patterns of migration and refuge led to rising numbers of increasingly heterogeneous immigrant students in educational systems worldwide, further increasing the importance to identify how these students are negatively affected at various stages of education and what protective factors can help them succeed. Therefore, this symposium with contributions from Germany, Sweden and Ireland aims to give an overview over the challenges these students are facing and what factors can be beneficial for overcoming them. The first contribution focuses on refugee students entering the school system and the role that language proficiency and other factors play for successfully starting school. Next, educational participation and language development of second generation immigrant students before and during elementary school are investigated with regard to family background. The third contribution compares recently immigrated students at the upcoming transition to secondary school with peers regarding school track recommendation, competences and life satisfaction, considering also potential protective factors like students' vocabulary. Finally, potential measures to facilitate immigrant students' success are presented based on recent developments in Swedish primary and secondary education, discussing both the reasoning behind, and challenges for successfully implementing them. The symposiums brings together central lines of current research from different countries and disciplines. The findings are vital to concluding what forms of support are most beneficial for immigrant students, providing a basis for developing programs aimed at the specific needs of immigrant students to help them meet the challenges they face.

Primary school enrollment of refugee children in Germany
Presenting Author: Melanie Olczyk, Martin-Luther Universiät Halle-Wittenberg, Germany; **Co-Author:**Julian Seuring, Leibniz Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:**Gisela Will, Leibniz Institute for Educational Trajectories (LIfBi), Germany

In the context of the refugee movements between 2010 and 2020, many refugees also came to Germany – among them many children. For children who fled their country of origin before starting school, enrollment in primary school in the host country is one of the first important steps in their educational biography. We examine the conditions under which the start of primary education is delayed among school-age refugee children. In addition, we investigate whether refugee children attend regular classrooms or so-called 'newcomer' classrooms (i.e., separate classes for refugees and immigrants with special education, such as language instruction) upon entering primary school. We used data from the study ReGES, which was conducted in five German federal states. For the analysis, we used a subsample of N=677 children who were of school age in wave 2 (2019) and who would normally have started primary school in the 2018/19 school year. The results showed that the majority of refugee children are enrolled in school according to their age and attend a regular class. Although the quota of delayed refugee children was low (7.5%), it was higher than the quota among native children. In particular, children from educationally disadvantaged backgrounds seemed to be affected. Furthermore, there was also a small group of refugee children who attended separate immigrant classes. In addition to state-specific regulations, the lack of German skills played a particularly important role here.

English language and reading development of migrant children in Ireland
Presenting Author: Merike Darmody, The Economic and Social Research Institute, Ireland; **Co-Author:**Helen Russell, The Economic and Social Research Institute, Ireland; **Co-Author:**Frances McGinnity, The Economic and Social Research Institute, Ireland

Ireland provides a useful case study into the experiences of second-generation migrants in a 'new immigration country'. To date relatively little is known about how the Irish-born children of these migrants are faring in English language development compared to their Irish peers. This paper draws on a large representative cohort study of children born in 2008, *Growing up in Ireland*, one third of whom are of migrant origin (14% with one parent born abroad and 19% with both parents (or lone parent) born abroad). This paper use OLS modelling and Gelbach decomposition analysis to examine how country of birth, linguistic and ethnic background of parents influence children's English vocabulary and reading scores from age three to age nine, and the role of socio-economic status, child characteristics and school characteristics in explaining these relationships, and a lagged dependent variable model to explore progression over time. Results suggest considerable convergence in English language scores over time: at age three, 60% of migrant-origin children are in the bottom quartile in the English vocabulary test, but by age 9, only 26% were in the bottom quintile for reading. Parents' linguistic background is more important than country of birth or ethnic background in predicting reading scores at 9 years. Important factors also include lower income and attending disadvantaged schools and coming from 'mixed' family – one Irish and one foreign-born parent.

What helps immigrant and refugee children succeed at the end of German primary school?
Presenting Author: Sebastian Nicolas Thomas Vogel, TU Dortmund University, Germany; **Co-Author:**Justine Stang-Rabrig, TU Dortmund University, Germany; **Co-Author:**Philipp Jugert, Institute for Psychology of Duisburg-Essen University, Germany; **Co-Author:**Birgit Leyendecker, Faculty of Psychology, Child and Family Research, Ruhr-University Bochum, Germany; **Co-Author:**Nele McElvany, TU Dortmund University, Germany

Students' school success at the end of primary school comprises various aspects like competences but also well-being and teacher's track recommendation, as the chosen secondary track is strongly influential for the following educational pathway in the German education system. An immigrant background is often negatively related to school success but how these relations appear for recently immigrated and refugee children specifically remains largely unclear. Their share in German schools has strongly risen over the last decade, making it vital to investigate potential negative effects for this especially vulnerable group. Additionally, considering mediators of the relation of their family background and school success (e.g., vocabulary) can reveal potentially protective factors. A sample of 278 German fourth grade students (53.2% female; M_{age} = 10.45, SD = 0.55; 36.4% recent immigrants or refugees), performed standardized tests and answered questions on variables of interests while teachers provided information on grades and track recommendation. Controlling for cognitive abilities and socioeconomic background, logistic regression revealed a significantly lower probability of receiving an academic school track recommendation for recent immigrant or refugee students compared to other groups. Structural equation models considering additional family background variables revealed that refugee/immigration experience related to lower reading competence, worse grades and lower probability of academic track recommendation, but not life satisfaction. Vocabulary partially mediated the relation of refugee/immigration experience and the aforementioned outcomes. Findings underline the relevance of immigrant students' vocabulary as a protective factor against negative background effects. Further implications are discussed in the presentation.

Determinants of school success for immigrant children - the case of newly arrived students in Sweden
Presenting Author: Nihad Bunar, Department of Special Education, Stockholm University, Sweden

Based on a thorough review of mainly recent Swedish literature, and conclusions from three research projects, the aim is to present and explore organizational models for reception, schooling of and provision of support measures to newly arrived migrant students (NAMSs) in Sweden. Main organizational models for elementary schools (separate classes and direct immersion) and for upper-secondary schools (Language Introduction Program) are presented and explored. An overall conclusion is that the organizational models deployed in elementary schools affect conditions for inclusion of NAMSs only to a certain degree. The Language Introduction Program does not facilitate inclusion by removing obstacles, focusing on individual needs and strengths and by providing shared physical spaces. As evident from research accounts, precisely the opposite seems to be taking place. Additionally, two major support measures are presented and explored: a) the initial assessment of students' background and experiences of learning and schooling; b) multilingual classroom assistance. The overall conclusion is that high ambitions of both are being considerably distorted in the enactment process, undermining their capacity to promote social and pedagogical inclusion of NAMSs. Finally, the policy has to pay more attention to how ambitious support measures are negotiated in the process of their enactment and that a critical gaze ought to be redirected from only focusing models, without underestimating their impact, to individual circumstances and educational needs and strengths of every student.

Session A 7

22 August 2023 12:15 - 13:45
UOM_A02
Symposium
Assessment and Evaluation

The Development of Feedback Literacy: From Intervention Programs to Programme Interventions

Keywords: Curriculum Development, Feedback, Higher Education, Self-regulated Learning and Behaviour, Social Aspects of Learning and Teaching, Teacher Professional Development
Interest group: SIG 01 - Assessment and Evaluation
Chairperson: Martijn Leenknecht, HZ University of Applied Sciences, Netherlands
Organiser: Martijn Leenknecht, HZ University of Applied Sciences, Netherlands
Discussant: Rachelle Esterhazy, University of Oslo, Norway

With the introduction of the concept of 'feedback literacy' by Carless and Boud (2018), research focus has shifted from feedback as external input to the role of the individual in feedback processes (Nieminen & Carless, 2022). The notion has grown that feedback processes can only be successful when participants have sufficient feedback literacy. This raises the question: how do persons become feedback literate? In this symposium we take the conceptualisation by Carless and Boud (2018) as starting point to discover the development of feedback literacy in students and teachers in higher education. The four studies in this symposium capture the broad perspective of feedback literacy, from developing skills and abilities, socialisation, to building identity through discourse (Nieminen & Carless, 2022). In a scoping review (Presentation 1), the nature and scope of intervention studies is reviewed to explore key aspects of developing feedback literacy through intervention programs. The social context and process of socialisation is mapped in relation to identity building (Presentation 2) and feedback seeking behaviour (Presentation 3), to shed light on feedback literacy as social construct and the impact of the context on the development of it. In the last presentation the impact of programme design on students' and teachers' feedback literacy is explored. The combination of observational and intervention studies provides a powerful basis for scientific discussion on intervening aspects from the social context on participants' feedback literacy. Moreover, the symposium provides a wide palette from interventions programs to programme interventions to support feedback literacy.

Can Students' Feedback Literacy be Improved? A Scoping Review of Interventions
Presenting Author: David Boud, Deakin University/University of Technology Sydney, Australia; **Presenting Author:**Joanna Tai, Deakin University, Australia; **Co-Author:**Tegan Miller, Deakin University, Australia; **Co-Author:**Phillip Dawson, Deakin University, Australia

Empirical research into feedback literacy has rapidly developed, as studies look for ways to increase positive feedback behaviours in students. As interventions are established, questions remain surrounding which elements of feedback literacy can be successfully improved in practice. This paper seeks to explore the key aspects concerning the development and implementation of feedback literacy interventions. A scoping review was conducted to address two research questions, including the foci, nature, and success of interventions. A total of 16 papers met the criteria for review. The review found evidence of enhanced feedback literacy in students, such as managing perceptions and attitudes, improving understanding of the student role, and having more confidence and agency in the feedback process. Implications and recommendations for future feedback literacy studies are discussed.

The Development of Feedback Literacies and Identities of First Year Education Students
Presenting Author: Juuso Henrik Nieminen, The University of Hong Kong, Finland

The idea of feedback literacy has gained widespread attention in higher education literature, yet not much is known about the longitudinal development of students' feedback literacies over time. This study takes an in-depth narrative approach to understand the development of feedback literacy in its socio-cultural context. The dataset consists of four narrative interviews as conducted for five first-year students in the specific context of an early education programme in a university in Hong Kong. Through in-depth narrative inquiry, the analysis shows how the students' feedback literacies develop in tandem with their evolving identities as future 'assessors'. The student narratives take place in the test- and competition-driven context of Hong Kong; the study sheds light on the critical aspects of feedback literacy by discussing how the students wish to use their feedback literacies to build more sustainable futures of assessment and feedback in this context.

Feedback Seeking of Undergraduate Nursing Students: From Whom and Why?
Presenting Author: Martijn Leenknecht, HZ University of Applied Sciences, Netherlands; **Co-Author:**Hanneke Wiltjer, HZ University of Applied Sciences, Netherlands

Understanding (the development of) feedback literacy requires a perspective that looks beyond the individual student. The social learning context of the student determines their feedback literacy and active involvement in feedback processes. In the current study, social network analysis is used to map students' proactive feedback behaviour in medical education. Students were asked to indicate from whom and why they will seek feedback. These nodes were connected to each other and graphically plotted in a network to obtain new insights. Findings showed that students asked for feedback within their learning 'bubble' first, from others who are at a non or low-hierarchical distance from themselves. These persons were asked for feedback because of their overview over the learning process of the student and their perspective and closeness. Those findings show that teachers could support students more in crossing the boundaries and asking for feedback from others than the usual subjects.

Student and Teacher Feedback Literacy in the Context of Programmatic Assessment
Presenting Author: Liesbeth Baartman, University of Applied Sciences Utrecht, Netherlands; **Co-Author:**Natalie Liebrechts, Utrecht University, Netherlands

Feedback literacy is viewed as a process in which students actively make sense of information from different sources to enhance their work. This fits programmatic assessment, in which students are viewed as active participants in the feedback process. Programmatic assessment involves the longitudinal collection of "data-points" about student learning. In programmatic assessment, feedback has a dual purpose: [1] students collect feedback from different perspectives (e.g., teachers, peers, workplace) on their data-points, with the aim to foster learning; and [2] data-points and feedback are used for later (summative) decision-making. This may leads to confusion, reluctance in giving critical feedback and the need to document written feedback. Therefore, taking the perspective of feedback literacy might help illuminate some problems experienced with the dual purpose of feedback in programmatic assessment. Research questions therefore focused on students' and teachers' feedback literacy features in the context of programmatic assessment and this dual purpose of feedback. Students (N=18) and teachers (N=11) of a ba-course in the paramedic domain were interviewed individually or in focus groups. This ba-course implemented programmatic assessment and students and teachers thus experienced the dual purpose of feedback. Results show some specific assessment literacy features in the context of programmatic assessment. Teachers need to connect feedback on single data-points to long term learning. Both teachers and students sometimes struggled with dual roles of feedback giver and decision-maker. Students reported increased evaluative judgment capabilities.

Session A 8

22 August 2023 12:15 - 13:45
UOM_CR
Symposium
Instructional Design

Emotional design and the necessary but not sufficient influence of triggering motivation

Keywords: Comprehension of Text and Graphics, Game-based Learning, Instructional Design, Interest, Metacognition, Motivation, Multimedia Learning, Video-based Learning
Interest group: SIG 06 - Instructional Design
Chairperson: Tino Endres, University of Freiburg, Germany
Organiser: Tino Endres, University of Freiburg, Germany
Discussant: K. Ann Renninger, Swarthmore College, United States

In many types of learning materials that are popular in the internet, such as instructional videos or games-based learning, aesthetics play an essential role. Research on emotional design investigates the impact of aesthetical design features on learning. Recent findings in this field point towards possible positive effects on learning that can be attributed to increased motivation and engagement as well as to cognitive aspects such as reduced unproductive cognitive load.

In this symposium, we examine four aspects (partly within or between contributions) that might moderate the effectiveness of emotional design and should be considered when developing theoretical models on emotional design and its use in instructional design. The four aspects are the learning setting in which the emotional design is implemented (game-based or instructional learning), the age of the learners, the duration of the learning situation, and the surrounding learning situation such as narrative framing or attractive alternative behavior. All four contributions consider motivational as well as cognitive variables when explaining potential learning gains. The presented studies suggest that triggering motivation is a necessary but not sufficient condition for positive effects of emotional design. The development of the motivation, especially situational interest will play an essential role in the discussion of those four studies.

Contextual animation in multimedia learning materials for children: saga of null results continues
Presenting Author: Cyril Brom, Charles University, Czech Republic; **Co-Author:**Karolína Schubertová, Czech Television, Faculty of Arts, Czech Republic; **Co-Author:**Anna Drobná, Faculty of Education, Faculty of Mathematics and Physics, Czech Republic; **Co-Author:**Kristina Volná, Czech Television, Czech Republic

Empirical evidence on effectiveness of 'emotional design' approaches for primary school children is limited. This study examines effects of one specific emotional design approach, contextual animation, on learning outcomes and situational interest in the case children 9–10 years of age. Contextual animation refers to the non-expository animation of context-providing representational pictures. Unlike decorative animation, contextual one does not add extraneous elements. In the present study, children studied about exponential growth and public opinion polls from two 3-min-long narrated videos either with or without contextual animation (N = 50; within-subject design; the order of video topics and the type of animation were counterbalanced). Null results were found both as regards learning outcomes and situational interest. This study increases a body of literature pointing at limited effects of emotional design approaches in the case of preadolescents.

How emotionally designed scaffolds affect learning and motivational outcomes in game-based learning?
Presenting Author: Antti Koskinen, University of Tampere, Finland, Finland; **Co-Author:**Jake McMullen, University of Turku, Finland; **Co-Author:**Manuel Ninaus, University of Graz, Austria; **Co-Author:**Kristian Kiili, Tampere University, Finland

In recent years, the importance of emotions in learning has been increasingly recognised. Applying emotional design to induce positive emotions has been considered a means to enhance the instructional effectiveness of digital learning environments. However, only a few studies have examined the specific effects of emotional design in game-based learning. This quasi-experimental study utilised a value-added research approach to investigate whether emotional design applied to scaffolding in a game-based learning environment improves learning and motivational outcomes more than emotionally neutral scaffolding. A total of 138 participants, mean age of 11.5 (SD = 0.73) participated in the study. Sixty-eight participants played the base version of a fraction learning game (Number Trace), where scaffolding was provided with emotionally neutral mathematical notations, and 70 participants played the value-added version of the game using emotionally designed animated scaffolding agents. Pre-and post-tests were used to measure conceptual fraction knowledge and self-reported measures of situational interest and situational self-efficacy to evaluate motivational outcomes. Our results indicate that the emotional design applied to scaffolds can improve the educational value of a game-based learning environment by enhancing players' situational interest and situational self-efficacy. However, although the intervention improved the participants' conceptual fraction knowledge, there was no significant difference between the scaffolding conditions in participants' learning outcomes. These results suggest that emotional design can increase the educational impact of game-based learning by promoting the development of interest, as well as improving self-efficacy.

Narratives as feature of emotional designed whiteboard animations – learning effects and moderators
Presenting Author: Sascha Schneider, University of Zurich, Switzerland

Whiteboard animations can be used to acquire knowledge on various topics in a narratively presented form. However, understanding narratives as a feature of emotional design has not yet been examined. In a series of three between-subject experiments, various attempts to create a narrative context in whiteboard animations are shown and examined for their contribution to learning enhancement. In addition, the research will help to clarify the extent to which possible moderators affect the effect of narrative support on learning. Thus, in Experiments 1 and 2 the influence of procedural character on the effect of narration was investigated, whereas in Experiment 3 a personal address of the learner was analyzed. In all experiments, data on cognitive and affective processes perceived during learning is used to explain found effects. Results show that narratives can have a major impact on learning outcomes. In addition, the effect of narratives is higher when a procedural character and a personal addressing is used.

Can emotional design be an aid to overcome the hurdle of high opportunity-costs in learning?
Presenting Author: Charlotte Vössing, University of Freiburg, Germany; **Co-Author:**Tino Endres, University of Freiburg, Germany; **Co-Author:**Alexander Eitel, University of Giessen, Germany; **Co-Author:**Alexander Renkl, University of Freiburg, Germany

More and more learning happens on digital devices such as laptops. Those devices increase the flexibility of learners, especially in challenging times such as the pandemic, and can support productive home schooling or similar concepts. However, they also come with the challenge that they provide many attractive alternative behaviors, causing high opportunity-costs. The emotional design of the learning material might help students coping with those high opportunity-costs by its potential to trigger situational interest and reduce cognitive load. In this study a 2x2x2 mixed design is implemented varying video-design (emotional vs. neutral), opportunity-costs (without vs. with possibilities for alternative behavior) and repeated measurement (beginning vs. ending of the learning phase). Situational interest was assessed after learning to investigate the development of motivation. The participants (*N*=144) learned from 15-minute whiteboard-animation videos with a neutral design or with an emotional design, either shown with or without attractive alternative behavior options. The found results suggest that emotional design fosters learning outcomes in the end of prolonged learning sessions. This effect was mediated by situational interest and cognitive load. When integrating the opportunity costs, it showed that the impact of emotional design increased with the possibility of alternative behaviors. Overall, emotional design helped students to learn better in longer learning sessions and to cope with high opportunity-costs.

Session A 9

22 August 2023 12:15 - 13:45
AUTH_DC2
Symposium

Implications of different responses to errors. Perspectives from several educational contexts

Keywords: Attitudes and Beliefs, Classroom Management, E-learning/ Online Learning, Early Childhood Education, Emotion and Affect, Feedback, Motivation, Parental Involvement in Learning, Parents' Beliefs and Affect, Primary Education, Secondary Education, Teacher Effectiveness, Teacher Professional Development
Interest group:
Chairperson: Annalisa Soncini, University of Bologna, Italy
Discussant: Eleftheria Gonida, Aristotle University of Thessaloniki, Greece

Errors, mistakes and setbacks are an integral part of life. However, many educators and parents avoid talking about errors and failure reducing the opportunity to learn from them. Supportive feedback after mistakes, error-handling strategies and error friendly environments can is argued to promote students' and children's positive reactions towards errors as well as their self-regulation processes and learning. However, more empirical evidence on the role and benefit of dealing with errors within different contexts and in constructive ways is needed. This symposium brings together empirical research (longitudinal, experimental, and qualitative) from different educational settings (i.e., home, school, and professional training) and with different populations (i.e., mother-child dyads, primary and middle-school students, and teachers) to further explore the positive role of errors in learning and how to promote such environments. The four papers included in the symposium present innovative findings that add new insight on differences in individual perceptions of and responses to errors and failure in different contexts. Educational relevance and practical implications of the symposium lie in the possibility of applying evidence-based finding to promote error friendly learning environments, support more adaptive responses to errors and failure and to promote innovative teacher training. Keywords: Errors, Failure, Parents, Online learning, Teachers education

Error climate and alienation from teachers: A longitudinal analysis in primary school
Presenting Author: Gabriele Steuer, University of Bielefeld, Germany; **Co-Author:**Alyssa Laureen Grecu, Center for Research on Education and School Development, Germany; **Co-Author:**Julia Morinaj, University of Bern, Switzerland

How errors are handled in the classrooms is a crucial aspect of instruction quality and has multiple consequences for students' own dealing with errors, their learning, and achievement (Steuer et al., 2013). Teachers' unsupportive behaviours such as negative reactions to errors may increase students' alienation from teachers. Alienation from teachers comprises a decreasing sense of belonging to teachers (Hascher & Hadjar, 2018). Teacher-student interactions have a strong impact on students' academic as well as social learning experiences (Pianta et al., 2003). So far, little is known about the association between the error culture and students' alienation from teachers in primary school, and how this relationship develops over time. In our study, we used a sample of $N = 406$ students in 29 primary school classrooms in Switzerland. They were on average T1 10.3 years old ($SD = 1.0$), T2 10.9 years old ($SD = 0.5$), and 221 students were female (54.4 %). At two measuring points, they reported error climate and alienation from teachers. Multilevel analysis revealed that error climate at T1 negatively predicted alienation from teachers at T2. That means that a positive error climate is related to less alienation from teachers. Our findings close the gap to examine interrelations of error climate and alienation from teachers in the primary school setting. We found that error climate predicted alienation from teachers, which implies that improvements of dealing with errors may be beneficial for teacher-student interaction and attenuate alienation from teachers.Keywords: Primary education; Social aspects of learning and teaching; Error culture; Alienation from teachers; Longitudinal study

Supportive error feedback fosters students' positive emotions and motivation
Presenting Author: Annalisa Soncini, University of Bologna, Italy; **Presenting Author:**Maria Cristina Matteucci, University of Bologna, Italy

The learning from errors model proposes that positive feedback after an error may support students' adaptive affective-motivational and cognitive-metacognitive self-regulation processes useful to correct the error. Even with positive feedback, these adaptive responses to mistakes may be hindered if pupils are tested and evaluated. The purpose of the current study was to test experimentally the effect of giving supportive feedback after an error on students' adaptive reactions towards errors comparing an evaluative situation (e.g., receiving a grade for a final exam) and a not evaluative situation. We implemented an experimental manipulation base on four different conditions: positive feedback - grades, positive feedback - no grades, negative feedback - grades, and negative feedback - no grades. A total of 222 Italian middle school students took part in an online learning unit with experimental manipulation. During the manipulation, students were informed of the possibility of being graded or not for an end-lesson test (i.e., grading conditions) and were provided with positive vs negative feedback (i.e., feedback conditions) after the errors. The main finding showed a main effect of feedback condition, whereby students who received positive feedback reported more adaptive reactions towards errors than those who received negative feedback. No other significant effects were found. This study adds to other research findings on the importance of supportive and positive error feedback in promoting adaptive self-regulation processes helpful to learn from errors.Keywords: Feedback; Grading; Adaptive reactions towards errors; Online learning environment; Secondary education

How you talk to your kids about setbacks and failures matters
Presenting Author: Elizabeth Peterson, University of Auckland, New Zealand; **Co-Author:**Sharma Tanvi, The University of Auckland, New Zealand; **Co-Author:**Amy Bird, The University of Auckland, New Zealand; **Co-Author:**Elaine Reese, The University of Auckland, New Zealand; **Co-Author:**Annette Henderson, The University of Auckland, New Zealand; **Co-Author:**Varun Ramgopal, Madras Institute of Development Studies, India; **Co-Author:**Susan M B Morton, The University of Auckland, New Zealand

How parents talk to their children about recent setbacks and failures matters. In a longitudinal study of 250 mother-child dyads from diverse backgrounds analysis has found that the way mothers talk to their 8-year-old children about a recent setback is associated with their children's self-reported adaptability, bounce back and response to failures four years later. Findings suggest that the combination of conversational features modelled and discussed is important. We found that parental recognition of their child's emotion alongside a discussion of the range of resources available to the child was associated with higher levels of confidence in the children's ability to adapt to change and an increased chance of the child reporting they take time to learn from their mistakes at aged 12. Similarly, when mothers discussed with their child a clear plan to manage the disappointment *and* discussed a range of resources that were available to support the child in the future should the event occur again, this this was associated with increased child reporting of bounce back at age 12. As parents continue to look for ways to build their children's resilience to manage increasingly uncertain times, our findings suggest that parent-child conversation can offer an early guide to children and help build their confidence that they can navigate and learn future challenging events. Keywords: Parents, Errors Adaptability, Resilience

The value of (learning from) mistakes in teacher education in Finland and Germany
Presenting Author: Annika Breternitz, Technische Hochschule Ostwestfalen-Lippe, Germany; **Co-Author:**Maria Tulis, University of Salzburg, Austria

Teachers' everyday error management in the classroom is one important aspect of their professional competence. This comprises (a) the ability to deal constructively with students' errors – and, thus, the knowledge of possible types of errors – and (b) adaptive error beliefs inclusive of error tolerance and openness to learning from mistakes. The purpose of this study was to explore how teacher education programs prepare teachers to meet these expectations or build these competencies. In order to identify indicators of learning from mistakes during teacher education and everyday teaching practice, we analyzed comprehensive interviews with 27 teachers of different subjects and different school forms in Germany (NRW) and Finland (southern Finland and middle Finland). The data were coded into different categories: expressions of dealing with errors in the classroom, recollections of acquiring of theoretical knowledge about errors during teacher education, retrospective accounts of experience learning from mistakes and mentors' feedback during initial teaching practice, and indicators of teachers' current error-related belief system and their suggestions for dealing with mistakes. Based on these dimensions, we identified different values of failure and errors as an opportunity for learning and improvement as being present in the teachers' narratives. Respondents expressed different attitudes towards mistakes, as well as constraints of constructive error-related learning opportunities. Interestingly, our findings suggest that teacher education may have little impact on adaptive activities and beliefs about dealing with errors. Keywords: qualitative methods, teacher professional development, educational psychology, interview-method; attitudes and beliefs

Session A 10

22 August 2023 12:15 - 13:45
AUTH_TE2
Single Paper
Assessment and Evaluation, Higher Education

Online Learning in Higher Education

Keywords: Attitudes and Beliefs, Comprehension of Text and Graphics, Digital Literacy and Learning, E-learning/ Online Learning, Educational Technologies, Feedback, Higher Education, Multimedia Learning, Pre-service Teachers, Quantitative Methods, Social Aspects of Learning and Teaching
Interest group: SIG 01 - Assessment and Evaluation, SIG 02 - Comprehension of Text and Graphics, SIG 04 - Higher Education
Chairperson: Daniel Dinsmore, University of North Florida, United States

The Role of Attitudes, Peer and Lecturer Norms in Predicting How Students Use Lecture Recordings.
Keywords: Attitudes and Beliefs, Educational Technologies, Higher Education, Quantitative Methods
Presenting Author: Kasia Banas, University of Edinburgh, United Kingdom; **Co-Author:**Thomas Thejll-Madsen, University of Glasgow, United Kingdom; **Co-Author:**Anita Tobar-Henríquez, University of Edinburgh, United Kingdom; **Co-Author:**Eva Murzyn, University of Edinburgh, United Kingdom

Given the widespread availability and use of recorded lectures in higher education, the key research question is not *if* students use lecture recordings, but rather *how* they use the recordings, and how educators can support them to use recordings most effectively. Indeed, a distinction is made in the literature between using lecture recordings as a substitute to attending live lectures (watching *instead of* attending; usually undesirable) and using them as a supplement to

attending live lectures (watching *in addition to* attending; usually desirable). This study examined the demographic and psychological variables associated with the use of lecture recordings as a substitute or as a supplement. We measured the students' own opinions about attending live lectures and using lecture recordings (attitude), students' beliefs about what their classmates thought about these behaviours (peer norm), and students' beliefs about what their lecturers thought about these behaviours (lecturer norm). Using data gathered in a large introductory psychology course (n=212), we found that students had a positive attitude and perceived a positive peer norm towards all three behaviours. Their perception of lecturer norm was more nuanced, with substitution perceived to be the least accepted by lecturers. Generally, the more positive the students' own attitude and the perceived peer norm towards the focal behaviour, the more likely students were to engage with lectures in that way. These findings suggest that attitudes and social norms may be useful targets for educational interventions promoting the use of lecture recordings as a supplement rather than substitute.

Measurement and Promotion of Critical Online Reasoning Skills among Young Professionals
Keywords: Digital Literacy and Learning, Educational Technologies, Higher Education, Quantitative Methods
Presenting Author: Lisa Martin de los Santos, Johannes Gutenberg University of Mainz, Germany; **Co-Author:**Olga Zlatkin-Troitschanskaia, Johannes Gutenberg University of Mainz, Germany; **Co-Author:**Marie-Theres Nagel, Johannes Gutenberg University Mainz, Germany; **Co-Author:**Denis Federiakin, Johannes Gutenberg University of Mainz, Germany

Although young professionals across different domains are increasingly using digital media as information and learning tools, little research has been conducted on the actual use of online information and the promotion of corresponding Critical Online Reasoning (COR) skills in post-university education. With our newly developed digital assessment and training tool, we investigate how the COR skills of young professionals can be measured and promoted at the beginning of their professional training. We determine how the COR facets are measured in young professionals and to what extent they can be improved through online COR training. Using a longitudinal panel design, we analyze the COR skills of young professionals using both performance (COR responses) and process data (log files). Participants were asked to conduct an open-ended web search, rate online information or sources, and write an open-ended response to a short COR task. Following the pre-survey, an online training session was conducted in which participants were trained in the critical use of online information by learning strategies for Internet use. An analysis of the data from the pre-post-measurement was then conducted to evaluate the effectiveness of the digital training. The results indicate significant differences between the young professionals from different fields. A comparison of the results of the 1^{st} and 2^{nd} measurement shows initial evidence of changes in COR skills, suggesting that these skills can be developed in post-university training and that young professionals with previously weak COR skills in particular could benefit from such online training.

Keep Some Distance: Seductive Details Are Only Harmful When Closely Related to the Learning Content
Keywords: Comprehension of Text and Graphics, E-learning/ Online Learning, Higher Education, Multimedia Learning
Presenting Author: Lisa Bender, University of Freiburg, Germany; **Co-Author:**Alexander Renkl, University of Freiburg, Germany; **Co-Author:**Kim Brosemer, University of Education Freiburg, Germany; **Co-Author:**Alexander Eitel, University of Giessen, Germany

We investigated whether the negative effects of seductive details (i.e., interesting but irrelevant adjuncts in learning materials) are only apparent when the details' content is closely related to the learning topic (i.e., in the same domain) and they, therefore, are mistakenly deemed as relevant part of learning content. For this purpose, we conducted a study in which participants (N = 77) learned two expository texts either (a) without seductive details, or (b) with seductive details that were closely related to the learning content or (c) with seductive details only loosely related to the learning content. Our results revealed no effects on recall performance, but - as expected - we found that only the closely related seductive details harmed students' transfer performance. Self-reported perceived relevance of seductive details and extraneous cognitive load were, however, not affected by experimental condition. In summary, our results suggest that the negative seductive details effect is contingent upon the strength of relation between the details and the learning content.

How Social Cues Influence Students' Non-Cognitive Experiences In Online Feedback Processes
Keywords: Feedback, Higher Education, Pre-service Teachers, Social Aspects of Learning and Teaching
Presenting Author: Theresa Ruwe, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Elisabeth Mayweg, Humboldt University of Berlin, Germany

A variety of factors can influence feedback effectiveness and social (e.g., feedback provider or language) as well as non-cognitive aspects become increasingly important in learning research. Building on this, this study examines how varying feedback providers and personalisation influence self-efficacy, motivation, and emotions as well as the effectiveness of feedback, determined by students' perceptions and performance. N = 98 teacher students participated in the 3 (provider: peer, educator, AI) x 2 (language: neutral vs personalised) between-subject study. Regression analyses show that an AI as feedback provider is perceived more trustworthy than humans (F(2, 95) = 3.43, p < .05, R^2 = 0.07, η^2p = 0.07) and elicits more positive emotions (F(2, 94) = 2.66, p < .1, R^2= 0.05, η^2p = 0.05). Furthermore, motivation is positively (F(3, 93) = 2.71, p < .05, R^2= 0.01, η^2p = 0.05) and self-efficacy for ideation negatively influenced by neutral language (F(7, 89) = 2.01, p < .1, R^2= 0.14, η^2p = 0.02). Further analyses show that neutral feedback from educators is perceived the fairest (F(7, 89) = 1.91, p < .01, R^2= 0.13, η^2p = 0.09). Additionally, self-efficacy for ideation increases from neutral AI feedback F(7, 89) = 2.01, p < .1, R^2= 0.14 2.261; η^2p = 0.04). This confirms the impact of social cues in online feedback processes. Conclusively, social presence, elicited by feedback provider and personalisation, plays a crucial role. Results will be discussed in relation to their theoretical and practical implications for the implementation of online feedback processes.

Session A 11

22 August 2023 12:15 - 13:45
UOM_A08
Single Paper
Developmental Aspects of Instruction, Higher Education, Motivational, Social and Affective Processes

Motivation and Resilience during COVID-19

Keywords: Achievement, Attitudes and Beliefs, E-learning/ Online Learning, Higher Education, Inclusive Education, Learning and Developmental Difficulties, Motivation, Pandemic, Primary Education, Resilience, Self-regulated Learning and Behaviour, Well-being
Interest group: SIG 04 - Higher Education
Chairperson: Rolf Strietholt, Germany

Motivation and self-regulated learning during the COVID-19 pandemic - a systematic review
Keywords: Motivation, Pandemic, Self-regulated Learning and Behaviour, Well-being
Presenting Author: Tamara Van Gog, Utrecht University, Netherlands; **Co-Author:**Ewa Miedzobrodzka, Utrecht University, Netherlands; **Co-Author:**Willeke Kitselaar, Leiden University, Netherlands; **Co-Author:**George Burchell, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Julia Henrich, Leiden University, Netherlands; **Co-Author:**Chris Hoeboer, Amsterdam University Medical Centers Location AMC, Netherlands; **Co-Author:**Lydia Krabbendam, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Milene Bonte, Maastricht University, Netherlands; **Co-Author:**Wouter van den Bos, University of Amsterdam, Netherlands; **Co-Author:**Peter Verkoeijen, Erasmus University Rotterdam, Netherlands

The COVID-19 pandemic has unprecedented consequences for education. This systematic review aimed to determine the effects of online education during the pandemic on motivation and self-regulation, which are both vital for learning and academic achievement. We investigated factors that might support or impede motivation and self-regulated learning (SRL). We reviewed longitudinal, (quasi)experimental and cross-sectional studies that tested participants aged between 5-25 who were enrolled in online educational programmes during the COVID-19 pandemic, measured motivation or/and SRL, and explored their possible relationships with academic achievements, engagement, well-being, and basic psychological needs. Moreover, we examined individual differences in age, gender, socio-economic status, country, and learning disability as possible moderators of the outcomes of interest. Search of four databases yielded over 8k records, which were subsequently screened with Rayyan and ASReview. Based on 73 papers included in the review, it became apparent that both motivation

and SRL decreased during the pandemic period. (Quasi)experiments, which tested various forms of online education that aimed to support motivation and self-regulated learning, such as gamification or flipped classrooms, yielded mixed evidence. Such effects may depend on various underlying mechanisms, such as engagement, autonomy, or social support, and on individual differences, mainly in age and gender. Studies with a correlational design mostly indicated strong relationships between motivation, various aspects of self-regulated learning, and well-being. These findings provide a better understanding of how online education during the COVID-19 pandemic has affected students' motivation and self-regulated learning and offers insights that may be informative both for educational theory and practice.

Perception of academic success among face-to-face and distance students during the covid period
Keywords: E-learning/ Online Learning, Higher Education, Motivation, Pandemic
Presenting Author: Jean-Marc Meunier, Université Paris 8, France; **Co-Author:**Elisabetta Zibetti, Université Paris 8, France

The successive confinements in France during the Covid-19 pandemic have disrupted the work modalities of all face-to-face students. In this paper, we also question the impact on distance students. With a survey of 108 students from the University of Paris 8, we show that anxiety and motivation profiles differ between these two populations and that, paradoxically, the perception of academic performance decreases for the most anxious or least motivated distance students. We propose to relate these results to the absence of specific support and the deterioration of study conditions at home to explain these results and to resituate them within the framework of self-determination theory (Ryan & Deci, 2000) and distance learning (Hartnett et al., 2011).

Perceptions of elementary school students regarding remote learning due to COVID-19
Keywords: Achievement, Attitudes and Beliefs, Pandemic, Primary Education
Presenting Author: Edit Tóth, SZTE Institute of Education, Hungary; **Co-Author:**Benö Csapó, University of Szeged, Hungary

From spring 2020 on, due to the COVID-19 pandemic in many countries, the schools were closed and students were engaged in learning from home. In the last two years, several studies have shown the negative and diverse effects of remote learning on student performance and highlighted teachers', parents', and secondary and tertiary students' perceptions, but we have scarce information about elementary school students' perceptions. This study focuses on students' perspectives at ISCED 2, the support and activities students receive from their families and schools, access to digital tools for supporting learning, and the relationship between student experiences, beliefs, and learning outcomes in mathematics and reading. Data were collected in the frame of the Hungarian Educational Longitudinal Program in May and October 2021 (N = 1590). Students filled out a questionnaire consisting of adapted items from the PISA Global Crises Questionnaire Module (OECD, 2020), and completed a mathematics and reading test. Our results indicate that most of the students have tools for learning during the school closure. The most frequent form of parental and school activity and support was the control and monitoring of learning. The students whose results were lower in math and reading comprehension tests received more family and school support for learning at home, and those whose results were higher on average received support rarely or never.

Understanding E-resilience in Education: Reviewing Public Policy Education during and after COVID-19
Keywords: Higher Education, Inclusive Education, Learning and Developmental Difficulties, Resilience
Presenting Author: Mindel van de Laar, Maastricht University, Netherlands; **Co-Author:**Julieta Marotta, UNU-MERIT / Maastricht University, Netherlands

The right to education, a basic right included in Sustainable Development Goal 4, needs to be ensured even when shocks occur. Hence, educational systems need to be prepared to overcome shocks as quickly and effectively as possible. Clearly, during the global health pandemic COVID-19, most educational systems experienced a shock that they needed to overcome. At the time, digital technologies were the main elements that enabled educational systems to continue instructing the population. In this context, the concept of e-resilience became relevant because the capacity of educational systems to overcome such shocks was linked not only to the resilience of the actors but also to the system's capacity to use digital technologies. This paper sheds light on the drivers and challenges that various actors in the educational system experienced in dealing with the COVID-19 shock. Using a comparative case study design, with cases from The Netherlands, Nigeria, Argentina and The United States, we mapped e-resilience in public policy schools based on 36 (group)-interview data from 42 students staff, administration and programme directors. The findings highlight that challenges within the technological system result in system underperformance. Yet, challenges at the human level tend to be disruptive for learning and harder to overcome by the system. However, in each context there were numerous drivers – both at technological and human level as well as in the interaction. These can be used to structure stronger educational systems.

Session A 12

22 August 2023 12:15 - 13:45
AUTH_T202
Single Paper
Instructional Design, Learning and Instructional Technology

Virtual Reality Learning Environments

Keywords: Achievement, Computer-assisted Learning, Computer-supported Collaborative Learning, E-learning/ Online Learning, Educational Technologies, Engagement, Immersive Technologies for Learning, Instructional Design, Motivation, Primary Education, Science and STEM, Vocational Education and Apprenticeship Training
Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Elaine Munthe, University of Stavanger, Norway

What and how to learn with Virtual Reality Learning Environments?
Keywords: Achievement, Immersive Technologies for Learning, Motivation, Vocational Education and Apprenticeship Training
Presenting Author: Felix Kapp, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Presenting Author:**Pia Spangenberger, Universität Potsdam, Germany

Virtual Reality environments provide huge opportunities for learning experiences going beyond classroom settings. The immersive character and the corresponding experience of presence is associated with motivational and cognitive effects. Various frameworks linking the unique experience of immersive Virtual Reality (iVR) to learning have been developed in recent years (e.g. Makransky, 2021). There is, nevertheless, still need for empirical research on the effects of VR learning environments and the necessity of determining factors influencing the effects in educational settings such as schools. The present contribution introduces two empirical studies ($n_1 = 45$, $n_2 = 41$) investigating the effects of an immersive Virtual Reality Environment compared to studying text and picture material and to a classroom presentation. In both studies participants used either an iVR environment about offshore windenergy or studied material about the topic in a more traditional way. Results of the studies suggest motivational benefits of iVR while at the same time showing that participants of the text/picture and the classroom presentation group had advantages with regard to declarative knowledge compared to the iVR groups. Based on the findings existing models of Virtual Reality Learning are reflected. A special focus of the study lies on the implementation of iVR in schools, in particular in vocational education schools.

Desktop virtual reality learning environments: Can cues reduce search time and support learning?
Keywords: Computer-assisted Learning, E-learning/ Online Learning, Educational Technologies, Instructional Design
Presenting Author: Daniela Decker, Deutsches Institut für Erwachsenenbildung, Germany; **Co-Author:**Martin Merkt, Deutsches Institut für Erwachsenenbildung, Germany

In two pre-registered experiments, we investigated the effects of light and movement cues in a desktop virtual reality learning environment on search time and learning outcomes. Participants were asked to find 16 (Experiment 1) / 12 (Experiment 2) craft objects in a virtual workshop, while information about the respective object was narrated by a male off-screen voice. In Experiment 1 (within-subject design, 60 participants), we found that search time for small objects could be decreased by movement cues, but not by light cues. There were no significant effects on learning or the learners' mental representation of the virtual

environment. However, since the average search time regardless of the cueing method (M = 10.28, SD = 5.67) was substantially shorter than the narrated contents about the objects (average length: 44.13 seconds), participants may have had sufficient time to devote exclusively to the narrated information. Therefore, we shortened the narration of the narrated content in Experiment 2 to an average of 12.90 seconds. Results of Experiment 2 (between-subject design, 159 participants) revealed significantly faster search times for both cueing methods and better learning outcomes with the light cues, whereas movement cues did not affect learning. This result could be explained by the slightly reduced presence in the movement cue condition.

Primary teachers didactical design for students' learning in VR environments
Keywords: Computer-supported Collaborative Learning, Educational Technologies, Immersive Technologies for Learning, Primary Education
Presenting Author: Emma Edstrand, Halmstad University, Sweden; **Co-Author:**Sylvana Sofkova Hashemi, University of Gothenburg, Sweden; **Co-Author:**Jeanette Sjöberg, Halmstad university, Sweden

AbstractVirtual reality (VR) is an example of a technology that invites new ways of how to design learning activities. The aim of this study is to explore how teachers organize onsite and distance learning environments for multilingual study guidance to promote students' subject-specific learning. Multilingual study guidance is a support in Swedish schools to enhance the development of students' subject-specific learning in native language. There are limitations in the ways in which multilingual study guidance is designed. It is often the case that learning activities are not grounded in students' individual needs. VR constitutes a resource that can support individualized learning activities. The study is part of a Design-Based research project involving 3 researchers, 1 VR-designer, 2 teachers, 3 students from 2 schools in a cyclic process of systematic, iterative and reflective development of concrete educational activities. The results of the designs for learning demonstrate a planning for student-active practice where the student is encouraged to engage with the knowledge content in the virtual space moving around, showing knowledge by pointing/selecting, getting familiar with objects by holding them, watching a process, etc. The students are expected to show and demonstrate their knowledge, while discussing using acquired concepts in the knowledge domain. The study has pivotal implications for both research and practice regarding developing theoretical and practical outcomes in the context of developing students' subject-specific learning in multilingual study guidance.

The use of virtual reality scenarios in science: Results of a design-based research experiment
Keywords: Engagement, Immersive Technologies for Learning, Motivation, Science and STEM
Presenting Author: Bruno Poellhuber, University of Montreal, Canada; **Presenting Author:**Sebastien Wall-Lacelle, University of Montreal, Canada; **Co-Author:**Christine Marquis, Cégep de Saint-Jérôme, Canada; **Co-Author:**Normand Roy, University of Montreal, Canada

We are witnessing a decline in student interest in science and technology, which is often attributed to the abstraction of science concepts, the scope of the content and teacher-centred approaches. The use of VR simulations appeared promising in the COVID-19 period, when access to laboratories was scarce. For VR simulations, the pedagogical scenarios seem very important. This design-based research aims to explore the pedagogical and didactic potential of computer-based VR scenarios for postsecondary science courses. A mixed methodology relying on individual questionnaires and group interviews was deployed on seven sites with 39 teachers and 5,759 students, grounded in Pintrich's expectancy-value model of motivation and engagement, the TAM3 technology acceptance model, the theory of interest, and Mahlke's (2008) model of user experience. After using the simulations, both teachers and students reported advantages, but these varied quite a bit depending on who was responding. While teachers focus on the pedagogical advantages, such as diversifying teaching methods, students focus first on the affective aspects of the experience (fun, perceived enjoyment, etc.) and also on some advantages for learning (e.g., visualization). Multilevel regression models show that the scenario scores, associated with quality and complexity, are an important and significant variable at the teacher level.

Session A 13

22 August 2023 12:15 - 13:45
AUTH_T002
Single Paper
Assessment and Evaluation, Culture, Morality, Religion and Education, Learning and Social Interaction

Citizenship Education, Sustainability and Political Engagement

Keywords: Citizenship Education, Engagement, Environmental Education, Morality and Moral Development, Quantitative Methods, Secondary Education, Social Aspects of Learning and Teaching, Social Media, Sustainable Development, Tool Development
Interest group: SIG 01 - Assessment and Evaluation, SIG 13 - Moral and Democratic Education
Chairperson: Robin Nagy, UNSW, Australia

Civic education and social interactions at school as drivers of intended electoral participation
Keywords: Citizenship Education, Quantitative Methods, Secondary Education, Social Aspects of Learning and Teaching
Presenting Author: Daniel Deimel, University of Duisburg-Essen, Germany; **Co-Author:**Katrin Hahn-Laudenberg, University of Leipzig, Germany; **Co-Author:**Johanna Fee Ziemes, University of Duisburg-Essen, Germany; **Co-Author:**Hermann J. Abs, University of Duisburg-Essen, Germany

Through civic education and social interactions at school, students are able to develop more or less political knowledge and trust in political institutions. Both precede intended electoral participation. However, it is disputed whether the relationship between political knowledge, trust, and intended participation is consistent across countries. We analyse data from the International Civic and Citizenship Education Study 2016 that consist of representative subsamples for 14-year-old students (N = 14,567) in Bulgaria, Croatia, Denmark, and Germany (North Rhine-Westphalia). A structural equation model approach reveals that both political knowledge and trust in political institutions contribute to explaining variation in adolescents' intended electoral participation. The effect of political knowledge is partly mediated by trust, which in turn is negatively associated with political knowledge in Bulgaria and Croatia and positively in Denmark and Germany (NRW). These results are discussed in the light of country-specific differences in the political context of civic education.

Online political engagement of upper secondary students: Does media education have an impact?
Keywords: Citizenship Education, Quantitative Methods, Secondary Education, Social Media
Presenting Author: Tessa Consoli, University of Zurich, Institute of Education, Switzerland

Many studies from Switzerland, Germany and other countries showthat young people's political engagement in institutionalized politics is currently stagnating or even declining. Several scholars see growing possibilities for online participatory politics (e.g., online campaigns, mobilizations, fundraisings, discussions and petitions) as a new opportunity for greater political engagement among young people. However, only a small proportion of young people seem to be politically engaged online. Furthermore, it has been argued that the unequal distribution of skills and competencies necessary to safely participate in politics through digital media and navigate the dangers of the internet (e.g. misinformation, echo chambers, hate speech) require a pedagogical intervention. This study investigates the extent to which upper secondary school students in Switzerland are politically engaged online and whether school-based media education practices are related to students' online political engagement. Results show that 13-24% of the students are politically engaged online, that Swiss upper secondary schools put little emphasis on digital citizenship education and that production-oriented practices (e.g. the development of online content) seem relevant in promoting online political engagement.

Evaluating Education for Sustainability: Survey creation based on a Systematic Literature Review
Keywords: Citizenship Education, Secondary Education, Sustainable Development, Tool Development
Presenting Author: Alessio Surian, Università degli Studi di Padova, Italy; **Co-Author:**Diego Posada, University of Padova, Italy; **Co-Author:**Diego Di Masi, University of Turin, Italy

Education for sustainability (EfS) responds to complex matters such as environmental crises including climate change and biodiversity loss. There is robust available literature of case studies focused on EfS in formal education at the primary school level. However, how EfS is conducted in secondary schools, to what

end and the effects on students is less frequently explored (Taylor et al. 2019). Secondary school students are particularly relevant in this matter since they are approaching adulthood, which means they can vote, take active part in civil matters and make choices as consumers (Ferkany & Whyte, 2013).We conducted a systematic literature review regarding EfS assessment methods in secondary schools. The study explores the following three inter-related research questions: What evaluation or assessment mechanisms are available in the literature? What are the characteristics and focus of the evaluation or assessment mechanisms available? In which contexts are they used? and how?What are the limitations and opportunities of such evaluation and assessment mechanisms? Based on the review, we created a 53-item survey aimed at understanding students' values, attitudes, and behaviours that are relevant and worth discussing within the key competencies in sustainability frameworks (Bianchi, 2020; Brundiers et al. 2020; Glasser & Hirsh, 2016; UNESCO 2019) and in relation to ways to operationalize them (Sterling et al., 2017). The questionnaire has been administered to over 400 students in Northern Italy and data have been benchmarked in relation to both other sustainability surveys and to key educational topics.

Sustainable citizenship in South America
Keywords: Citizenship Education, Engagement, Environmental Education, Morality and Moral Development
Presenting Author: Antonia Larrain, Universidad Alberto Hurtado, Chile; **Co-Author:**Paulina Freire, Pontifiica Universidad Ctaólica de Chile, Chile; **Co-Author:**Ana Andaur, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Maria Teresa Rojas, Universidad Alberto Hurtado, Chile; **Co-Author:**Hernán Cofré, Pontificia Universidad Católica de Valparaíso, Chile; **Co-Author:**Claudia Vergara, Universidad Alberto Hurtado, Chile; **Co-Author:**Joaquin Grez Mansilla, Pontificia Universidad Católica de Chile, Chile

The question of sustainability in general is central to a contemporaneous notion of democracy (Kyle, 2020), that is, whether present generations are able to deal with these kinds of global crisis without risking the living conditions of future generations. This involve what we call sustainable citizenship (Kurian et al., 2014), or the active participation and engagement with the exercising of rights in a field of plural interests, often contradictory and in conflict, in a way that allows needs to be addressed. However, to date this idea of citizenship has not been empirically tested. The aim of this paper is to report a study that explored the relation between climate change and citizenship variables. We adapted two questionnaires: one to assess knowledge and attitudes toward climate change and other to assess political and civic knowledge and skills. 237 students (97 female) answered climate change and 218 students (84 female) answered the citizenship questionnaire. Confirmatory factor analyses were conducted to test the scales and fixed effects hierarchical regressions (controlling by school variables and perceived socioeconomical status) were conducted to explore the relations between scales. Results show that knowledge of climate change negatively predicted authoritarianism justification; political self-efficacy, knowledge of climate change, and attitude towards climate science positively predicted attitude towards future political participation; and attitude towards climate science and environmental interest positively predicted, and authoritarianism justification negatively predicted, attitudes toward mitigation.

Session A 14

22 August 2023 12:15 - 13:45
UOM_A13
Single Paper
Teaching and Teacher Education

Research-based Teacher Education

Keywords: Attitudes and Beliefs, Competencies, Curriculum Development, Lifelong Learning, Pre-service Teachers, Qualitative Methods, Quantitative Methods, Reasoning, Researcher Education, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: David Purpura, Purdue University, United States

Research-based teacher education: preparing students to be research active teachers.
Keywords: Competencies, Lifelong Learning, Pre-service Teachers, Researcher Education
Presenting Author: Aimie Brennan, Marino Institute of Education, Ireland

In countries where student outcomes are high, teacher education is required to be research driven and 'graduate teachers [apply] research to their work in a reflective way' (Sahlberg, 2012. p. 15). Significant policy reform in teacher education in Ireland has advocated for an enquiry-oriented, evidence-informed vision of the profession. Teachers are expected to become reflective practitioners who actively engage in and with research to regularly develop their practice. Research on student teacher preparedness to conduct research in their future careers is scarce (van der Liden et al., 2015). Interpretations of research-based education, and practitioner engagement with and in research varies widely (Leat et al., 2015). This paper reviews accreditation standards for initial teacher education in Ireland, UK and Norway to identify variations in research-based teacher education (TC, 2020; DfE, 2019). Subsequently, this paper draws on scholarly literature on research competency and research preparation in higher education (Griffiths, 2004; Healy and Jenkins, 2009; Mateo et al., 2012) to identify specific models of research competency development in undergraduate students. Finally, this paper also presents a framework outlines levels of competency from; research literacy, research engagement, applied research, and research dissemination and their association with the knowledge, skill and attitude of the student teacher. The success of students' engagement in research is based, not only on their ability to engage with published research but to conduct their own research, to exercise scholarly judgement and to contribute to new knowledge, ensuring that they are prepared to be research active, rather than simply research literate.

Legitimising undergraduate educational research methodology courses
Keywords: Qualitative Methods, Quantitative Methods, Teacher Professional Development, Teaching/Instructional Strategies
Presenting Author: Athanasios Verdis, National and Kapodistrian University of Athens, Greece; **Co-Author:**Liza Dorli, National & Kapodestrian University of Athens, Greece

Twenty two years after Lagemann's characterization of educational research as "elusive science", faculty members at departments of education around the world seek to agree on the term with questions like "what should be the content of a course on educational research methodology" and "who among faculty members should teach it". To answer these questions we have utilized a sociolinguistic theory known as "Legitimation Code Theory" that combines Bernstein's system of language codes and Bourdieu's concepts of fields of struggle and cultural reproduction. This theory has been used to explore knowledge and knower structures in a number of social practices. In our study, we have explored epistemic relations to the objects of educational research and social relations among those involved in teaching and learning educational research at undergraduate level. Through a mixed methods research design we have analysed life history interviews with pioneer teachers of educational research methods in Greece in 1970's and 1980s. We have also conducted two surveys concerning one thousand undergraduate students and seventy faculty members across Greece. We have concluded that realist language codes and the mathematical symbols are the main "knowledge codes" in educational research methods courses in Greece. Discourses emphasizing "who you are" in education are the "knower codes". The "right type of knowledge" and the "right type of knower" are being synchronized in the "legitimation" of educational research methodology as an undergraduate object.

Pre-service teachers' beliefs shape their views of the value of scientific evidence for teaching
Keywords: Attitudes and Beliefs, Pre-service Teachers, Quantitative Methods, Reasoning
Presenting Author: Timo Reuter, Rheinland-Pfälzische Technische Universität Kaiserslautern - Landau, Germany; **Co-Author:**Miriam Leuchter, RPTU Landau, Germany

Teachers are increasingly expected to implement research-informed teaching practice (RITP) in their classroom. However, they lack knowledge and skills in information-seeking and research methods. We therefore developed a 13-weeks university course addressing these skills and knowledge, and examined whether pre-service teachers' beliefs regarding the utility of science for teaching practice moderate their learning. We conducted a quasi-experimental pre-posttest design with an experimental group (EG) and a control group (CG). We measured information-seeking skills, research methods knowledge, beliefs

regarding the utility of science for teaching practice, and performance in evaluating scientific evidence. Multilevel models revealed differential learning effects depending on participants' perceived utility of science for teaching practice. The higher the perceived utility, the greater was the learning gain in the EG. In the CG, the pattern was reversed. Moreover, a latent profiles transition analysis revealed four different profiles with regard to pre-service teachers' perceived usefulness of strong scientific, limited scientific, and anecdotal evidence for decision making in school contexts. The higher participants' perceived utility of science for teaching practice, the higher was the probability for transitioning from an "intermediate" to a "scientific" profile. Moreover, the probability of transitioning from the "intermediate" to the "scientific" profile was higher in the EG than in the CG. Our findings suggest that pre-service teachers can acquire information-seeking skills and research methods knowledge. However, participants' beliefs affected their learning and evaluation of evidence. Thus, university courses should not only address knowledge, but also reflect on (false) beliefs to prepare future teachers for RITP.

Student teachers' research competences after writing a Master thesis in the Master of Teaching
Keywords: Competencies, Curriculum Development, Pre-service Teachers, Teacher Professional Development
Presenting Author: Stefanie De Jonge, Ghent University, Belgium; **Co-Author:**Hanne Tack, Ghent University, Belgium; **Co-Author:**Evelien Opdecam, Ghent University, Belgium; **Co-Author:**Leen Haerens, Ghent University, Belgium

Worldwide, there is an increasing attention to educate (future) teachers with an inquiring habit of mind and research competences. Teachers who have developed the competence to use and conduct research will be able to continually evaluate, innovate and improve their teaching. In this regard, an increased need is expressed to integrate research in teacher education programs. Recently, in Flanders, research was also integrated in academic teacher education programs, resulting in a master's degree in teacher education. To date, however, little is known about the implications of integrating research in teacher education in terms of how this improves student teachers' research competences. Following Astin's (1993) Input-Environment-Output model, this study examined the relations between student teachers' demographic and pre-program educational characteristics (input), the academic environment in which they are learning (context), and the development of their research competences and their satisfaction with writing an educational thesis (outcomes). By means of a survey, based on the Postgraduate Experience Questionnaire and Course Experience Questionnaire, 197 university student teachers from academic year 2019-2020 and 2020-2021 were asked about their actual experiences when writing the master thesis. The univariate hierarchical regression analyses showed that infrastructural support and students' intellectual motivation related positively to students' development of their educational research competences, while students' perceived workload negatively and the supervision students received with the thesis positively impacted their satisfaction. These findings imply that teacher educators and teacher training programs should pay attention to good infrastructural support, students' workload and respond to students' intellectual motivation.

Session A 15

22 August 2023 12:15 - 13:45
UOM_A04
Single Paper
Assessment and Evaluation, Instructional Design, Teaching and Teacher Education

Critical Thinking in Different Levels of Education

Keywords: Argumentation, Assessment Methods, Critical Thinking, Digital Literacy and Learning, Instructional Design, Primary Education, Qualitative Methods, Quantitative Methods, Secondary Education, Social Media, Teaching Approaches, Writing/Literacy
Interest group: SIG 01 - Assessment and Evaluation, SIG 11 - Teaching and Teacher Education, SIG 12 - Writing
Chairperson: Silke Vanparys, Ghent University, Belgium

A multi-country comparison of lower secondary students' critical thinking under different curricula
Keywords: Assessment Methods, Critical Thinking, Quantitative Methods, Secondary Education
Presenting Author: Samantha-Kaye Johnston, The University of Oxford, United Kingdom; **Co-Author:**Joshua McGrane, The University of Melbourne, Australia; **Co-Author:**Therese N. Hopfenbeck, The University of Melbourne, Australia; **Co-Author:**Mireia Vendrell Morancho, Universidad Complutense de Madrid, Spain

Critical thinking is an essential skill for life-long learning, and, given its increasing importance as a graduate attribute, it is vital to robustly evaluate how educational systems can best improve students' critical thinking through their curricula and classroom practices. This study evaluates the differences in the critical thinking skills of students in the International Baccalaureate (IB) Middle Years Programme (MYP), which explicitly emphasises critical thinking development in its curriculum and has been shown to facilitate classroom strategies to develop critical thinking, versus students enrolled in the national curricula in Australia, England, and Norway. The study comprised of 870 MYP (n = 386) and non-MYP (n = 484) students in Grades 9 and 10 across 21 schools. Data were remotely collected on their critical thinking skills, and several other relevant cognitive, non-cognitive and background characteristics. A propensity score matching approach was used to match the MYP and non-MYP groups on these characteristics and their critical thinking skills were compared using weighted regression. Findings showed that, overall, IB MYP students possessed significantly higher levels of critical thinking skills than their non-IB MYP peers with a moderate effect size. This advantage also held at both grade levels and across Australian and English students, with no significant difference for Norwegian students. Thus, the MYP appears to be a promising exemplar for enhancing critical thinking among secondary-aged students, although context needs to be considered. Based on these findings, recommendations of specific instructional strategies are offered, as well as future research to inform critical-thinking pedagogy.

The effects of reading and writing instruction on writing about historical significance
Keywords: Argumentation, Critical Thinking, Instructional Design, Writing/Literacy
Presenting Author: Johan van Driel, University of Amsterdam, Netherlands; **Co-Author:**J.P. van Drie, University of Amsterdam, Netherlands; **Co-Author:**Carla Van Boxtel, University of Amsterdam, Netherlands

The literacy demands set in the domain of history are high. In order to achieve historical understanding, students need for example to read historical accounts and write historical arguments. More knowledge is needed on effective instructional approaches for reading and writing in history. In an earlier study we found positive effects of a domain-specific reading instruction on the quality of students' writing in history. In this study we investigated the additional effects of a writing instruction to this reading instruction. In a randomized pre- post design, we compared the effects of a reading instruction followed by a writing instruction to a repeated reading instruction on text quality. Participants were 142 10^{th} grade students. To gain additional insight into the processes conducted, we asked 8 students from the combined reading and writing instruction to think aloud during the posttest. Text quality was analyzed with a previous developed coding scheme focusing on text structure, general writing quality, and reasoning about historical significance. Think aloud protocols were analyzed on reading processes, reasoning processes, and writing processes.Results showed that students in both conditions improved, but students who received reading and writing instruction improved more than students who received only reading instruction. Based on the think-aloud protocols, students who applicate elements of the instruction showed deeper understanding of historical perspectives and argumentation. This study shows that a combined reading and writing instruction improves students' writing in history and elicits processes such as understanding historians' perspectives and historical argumentation.

The filter bubble app: how can secondary school students become aware of algorithmic filtering?
Keywords: Critical Thinking, Digital Literacy and Learning, Secondary Education, Social Media
Presenting Author: Tjitske de Groot, Utrecht University, Netherlands; **Presenting Author:**Maria De Haan, Utrecht University, Netherlands

This research paper describes young people's ideas and understandings of technology related to their own social media use, with a particular focus on their knowledge and imaginations of the working of algorithms, as well as how they evaluate these workings for themselves. This study is part of a design based research in which an educational app is being designed that promotes algorithmic awareness, knowledge, agency and ethical reflection on the effects of algorithms for students in secondary education in the Netherlands. Drawing upon the concepts of algorithmic consciousness, imagination, and power, we

analyze how secondary education students make sense of the algorithmic workings of their social media apps. We discuss to what extent such sense making and 'making the algorithm work for them' can be seen as forms of agency as well as how technology that sorts, selects, secludes and judges in invisible ways can become 'educative' again.

Critical Thinking in Primary School – a Large Scale Design-Based Research Project
Keywords: Critical Thinking, Primary Education, Qualitative Methods, Teaching Approaches
Presenting Author: Emilia Andersson-Bakken, Oslo Metropolitan University, Norway; **Co-Author:**Kirsti Marie Jegstad, Oslo Metropolitan University, Norway; **Co-Author:**Tuva Bjørkvold, Oslo Metropolitan University, Norway

The project Critical Thinking in Primary School is an innovation project using design-based research to investigate how teachers and students in grades 1-7 can work with critical thinking using picture books and news. Critical thinking is a 21st century skill, and in Norway central in the competence definition laying ground for all teaching and learning from the 1st through 13th grade. In the project, we have collected data throughout three cycles in a timespan over 2 years. We have interviewed teachers, observed, and videotaped lessons and collected student products. Between each cycle, we have analyzed the data, both regarding the overall tendencies and more in detail focusing on one or two aspects of critical thinking. Preliminary findings show that students' critical thinking is affected by the teachers' understanding of critical thinking, notably when aspects broader than formal *Buildung* are included. Further, the teaching design and the teachers' facilitation of the classroom conversation are crucial in order to enhance critical thinking. This relates in particular for the teacher to make relevant and engaging startup activities, and to allow sufficient time for the students to think actively in a dialogic classroom where students build on each other's utterances. Finally, picture books and news are suited to inspire critical thinking, especially when thematizing ethical dilemmas or issues close to the students' sphere of interests. However, the teacher must plan actively for critical thinking directly linked to the content.

Session A 16

22 August 2023 12:15 - 13:45
UOM_A10
Single Paper
Higher Education

Well-being in Graduate Students

Keywords: Anxiety and Stress, Burnout, Competencies, Doctoral Education, Engagement, Ethics, Higher Education, Metacognition, Qualitative Methods, Researcher Education, Well-being
Interest group: SIG 04 - Higher Education, SIG 24 - Researcher Education and Careers
Chairperson: Anki Strom, Norway

Justice and metacognitive awareness as predictors of master students' wellbeing in supervision
Keywords: Ethics, Higher Education, Metacognition, Well-being
Presenting Author: Anne Haarala-Muhonen, University of Helsinki, Finland; **Co-Author:**Liisa Myyry, University of Helsinki, Finland

University students' wellbeing or lack of it has alerted higher education institutions in recent years. Especially, writing a master's thesis can be a stressful phase of studies, because it demands cognitive involvement, agency and metacognitive skills from students. Justice experiences has been found essential for human being in organisational context but research integrating supervision and justice experiences in higher education is scarce. The present study investigates students' experiences of master's thesis supervision and analyses the links between study-related burnout, metacognitive awareness and justice experiences in supervision. To conduct the study survey responses were collected by 441 master students from the Faculty of Law. The results of the survey revealed that metacognitive awareness and justice experiences in supervision were significant predictors of students' wellbeing in master's thesis project. The results confirmed earlier findings about the importance of justice experiences for human beings and open new avenues for future research in higher education.

How Does Supervision Influence Doctoral Supervisor's Occupational Wellbeing?
Keywords: Burnout, Competencies, Doctoral Education, Well-being
Presenting Author: Lotta Tikkanen, University of Helsinki, Finland; **Co-Author:**Henrika Anttila, University of Helsinki, Finland; **Co-Author:**Kirsi Pyhältö, University of Helsinki, Finland

PhD candidates' wellbeing has gained much attention in the field of doctoral education. For example, research has identified that high quality supervision plays a central role in PhD candidates' study-related wellbeing. However, research on the association between supervisory responsibilities, competencies and interaction and supervisors' occupational wellbeing has been surprisingly scarce. It can be assumed that supervisory interaction influences supervisors' occupational wellbeing, which further is likely to reflect back on supervisory interaction. In this study, we aimed to understand the interrelationships between doctoral supervisor's occupational wellbeing and quality of supervision better. Altogether 561 doctoral supervisors from research-intensive, multidisciplinary university participated in the study. Results showed that supervisors' occupational wellbeing in terms of work engagement, stress and burnout symptoms were related to their perceptions of the supervisory interaction, supervisory competencies and the support they received from the professional community. Also differences in occupational wellbeing were detected between supervisors in various positions, and those supervising mainly fulltime cf. part-time candidates and those supervising candidates working alone cf. candidates working in a group. The findings imply that supervisors' occupational wellbeing is highly embedded in supervisory practices and that individual and factors related to supervisee contribute to supervisors' wellbeing.

PhD holder transitions outside academia: The role of social support in (dis)engaging experiences
Keywords: Doctoral Education, Engagement, Qualitative Methods, Well-being
Presenting Author: Sara Rönkkönen, University of Helsinki, Finland; **Co-Author:**Viivi Virtanen, Häme University of Applied Sciences, Finland; **Co-Author:**Lynn McAlpine, University of Oxford / McGill University, Canada; **Co-Author:**Montserrat Castelló, Ramon Llull University, Spain; **Co-Author:**Kirsi Pyhältö, University of Helsinki, Finland; **Co-Author:**Marina García-Morante, Blanquerna, Universitat Ramon Llull, Spain

Globally, the number of PhD graduates is constantly increasing. The share of the PhD holders working outside the academia is growing accordingly (Germain-Alamartine et al., 2021) and not necessarily without challenges (Skakni et al., 2022). The present study aims to increase the awareness of the role of social support in engaging and disengaging experiences, reported by PhD holders who have made a career transition outside the academia. Our data comprise 30 semi-structural interviews from PhD holders in the UK, Spain, and Finland. The preliminary findings propose that various forms and sources of social support, or the lack of it, played a pivotal role in engaging and disengaging experiences. The practical implications of the study are related to PhD research and education development. Additionally, on a societal level, the findings of this study support the understanding of constantly changing labor markets that the PhD holders enter.

Precarious careers: postdoctoral researchers and wellbeing at work
Keywords: Anxiety and Stress, Higher Education, Researcher Education, Well-being
Presenting Author: Inge Van der weijden, Leiden University, Netherlands; **Co-Author:**Christine Teelken, VU University Amsterdam, Netherlands

The purpose of this paper is to understand how, in the context of labour market instability, postdoctoral researchers in The Netherlands experience their working conditions and their prospects and opportunities, in relation to their mental health and wellbeing. 676 postdocs of nine universities in the Netherlands completed an online questionnaire. Results show that 70% if the respondents indicated experiencing serious thoughts, feelings or conditions related to their mental health. Most commonly reported experiences are feelings under constant strain, concentration problems and sleeping problems. 39% of the postdocs are at risk of developing serious mental health problems, which can lead to anxiety and depression. Main stress factors are dissatisfaction with supervisor, colleagues and negative academic career perceptions. In addition, more mental health problems develop in case of conflicting demands. Half of the respondents provided an

explanation for their answers concerning their mental health. Based on a round of in-depth explorative investigations, we have diagnosed three categories of responses: positive, ambivalent and negative. The results of our study are a call for action: universities need to take initiatives to prevent mental health problems and should offer adequate support to postdocs who are already experiencing problems.

Session A 17

22 August 2023 12:15 - 13:45
AUTH_T102
Single Paper
Higher Education, Teaching and Teacher Education

Art Education

Keywords: Art Education, Classroom Assessment, Early Childhood Education, Feedback, Higher Education, In-service Teachers, Instructional Design, Qualitative Methods, Teacher Professional Development
Interest group: SIG 04 - Higher Education, SIG 05 - Learning and Development in Early Childhood, SIG 09 - Phenomenography and Variation Theory
Chairperson: Suzanne Hiller, United States

Variation theory as teaching theory. In hope for a sustainable classroom concerning assessment
Keywords: Art Education, Classroom Assessment, Feedback, Qualitative Methods
Presenting Author: Pernilla Ahlstrand, Department of Pedagogical, Curricular and Professional Studies,, Sweden

We will present and discuss preliminary analyses of the research project “On BOUNCE! Practice-based feedback – A study of Theatre, Teaching and Dance Situations”. The title ‘Practice based feedback’ refers to formative assessment that takes place during feedback in teaching situations. Filmed material from teaching situations is the starting point for stimulated recall discussions together with two different teacher teams in dans and theatre. The discussions will include planning of similar teaching situations where variation theory is used as teaching theory. Preliminary analyses and results from material collected autumn-22 and spring -23 will be discussed. The purpose of the project is to develop knowledge about knowing that is expressed in a physical form and to develop methods on a scientific basis that can strengthen teaching practices in the school subjects of dance and theatre, at upper secondary school level. This is proposed as one way to create a sustainable classroom in relation to assessment.

Performative arts training for Nursery teachers. Shared learning and impacts
Keywords: Art Education, Early Childhood Education, Qualitative Methods, Teacher Professional Development
Presenting Author: Anna Ciraso, Universitat Autònoma de Barcelona, Spain; **Co-Author:**Silvia Blanch, Universitat Autònoma de Barcelona, Spain; **Co-Author:**Gemma París, Universitat Autonoma de Barcelona, Spain

With the goal of introducing aesthetic experiences and artistic thinking in early childhood education, a training project for three nurseries was implemented with the involvement of international artists and cultural agents of the territory (within Erasmus+ project INTERSTICE: Encounters between artists, children and educators, 2020-1-ES01-KA203-082989). Teachers were involved in a performance, different workshops, a video feedback session with two artists and a joint closure activity; these processes allowed them to experience artistic situations, and re-think educational practices, relationships and learning scenarios. In order to identity individual learning of both teachers and artists, as well as eventual changes in the educational practices, this qualitative research was developed. Information was gathered through questionnaires, participant observation and interviews with artists, teachers and trainers. Results show different degrees of learning on the role of art in daily pedagogical practices, and deep reflexions about the function and attitude of the adults, in children’s aesthetic experiences. The core elements of this training proposal will be highlighted and the difficulties that were faced will be discussed, in order to facilitate other similar experiences within educational and cultural settings.

Art and Design teachers’ Personal Rules of Thumb while Designing Design Based Education Studios
Keywords: Art Education, Higher Education, In-service Teachers, Instructional Design
Presenting Author: Migchiel Riemer van Diggelen, NHL University of Applied Sciences, Netherlands; **Co-Author:**Marjanne van Gameren, Open University of the Netherlands, Netherlands; **Co-Author:**Arnoud Evers, Open University of the Netherlands, Netherlands

In Higher Vocational Education, innovations are shifting from teacher-oriented to student-oriented education. Moreover, boundaries between education and the professional field are blurring. This makes designing innovative learning environments a complex activity. This is recognized at NHL Stenden University of Applied Sciences (NHLS) in the Netherlands, where teachers design education in studios in the context of Design-Based Education (DBE). Teachers at NHLS turn out to have a need for support in designing studios. More in general, it is unclear which knowledge and skills teachers actually need to possess in order to adequately design education in studios. Rules of thumb of experienced designers of design education could provide insight into the practical knowledge that teachers need in order to design studios. Rules of thumb, derived from teachers’ practical knowledge, are ideas about characteristics that design education should have to achieve certain learning outcomes in students. Six teachers from the art and design disciplines participated in this multiple-case study. During the interviews, they created a design for a studio for their own teaching practice, thinking aloud. Through within- and cross-case analyses, insight into their rules of thumb and patterns was gained, revealing that learning theories are recognizable in teachers' rules of thumb. Teachers and their rules of thumb could be positioned on a dimension from cognitivism to social constructivism. Typical of social-constructivist rules of thumb is to focus on students' ownership of their learning processes and cooperation between different actors in an authentic context.

Session A 18

22 August 2023 12:15 - 13:45
UOM_R05
Single Paper
Teaching and Teacher Education

Teacher Professional Development, Teaching Quality and Academic Achievement

Keywords: Achievement, In-service Teachers, Meta-analysis, Qualitative Methods, Secondary Education, Teacher Effectiveness, Teacher Efficacy, Teacher Professional Development, Teaching Approaches, Teaching/Instructional Strategies
Interest group: SIG 11 - Teaching and Teacher Education, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Alexander Groeschner, Germany

Effects of teacher professional development on student academic achievement: A meta-analysis
Keywords: Achievement, In-service Teachers, Meta-analysis, Teacher Professional Development
Presenting Author: Natasha Dmoshinskaia, University of Twente, Netherlands; **Co-Author:**Adrie Visscher, Univ. of Twente, Netherlands; **Co-Author:**Marta Pellegrini, University of Cagliari, Italy

We present results from a meta-analysis of 145 experimental and quasi-experimental studies that used teacher professional development (TPD) programs in grades pre-K–12, examining the effect of TPD interventions on student achievement. We find an average weighted effect size of +0.08 standard deviations on achievement outcomes, with heterogeneity of most effects ranging from -0.16 to 0.31. Guided by the MUTOS framework, we tested separately categories of moderators related to Methods, Units, Treatments, Outcomes, and Settings characteristics. Findings of the meta-regression models showed that several moderators explained heterogeneity in effects across studies. Particularly positive outcomes were found for students in lower primary grades (K–2) compared to secondary or mixed grade levels. On treatment characteristics, programs focusing on a specific subject and delivering professional development using

workshops and coaching had larger impacts compared to respectively cross-curricular interventions and an only workshop delivering mode. In the final meta-regression that combined significant and marginally significant moderators from the previous models, grade level still showed an impact on student achievement.

The role of a data coach in supporting data use in school teams: voices of experts and practitioners
Keywords: In-service Teachers, Qualitative Methods, Teacher Efficacy, Teacher Professional Development
Presenting Author: Iris Decabooter, Hasselt University, Belgium; **Co-Author:**Ariadne Warmoes, Vrije Universiteit Brussel (VUB), Belgium; **Co-Author:**Katrien Struyven, Hasselt University / Vrije Universiteit Brussel, Belgium; **Co-Author:**Els Consuegra, Vrije Universiteit Brussel, Belgium; **Co-Author:**Roos Van Gasse, University of Antwerp, Belgium

A data coach is necessary to support school teams in the use of data to adjust school and classroom practices (Marsh, 2010; 2012). Research shows that depending on the context of the school, the profile of the data coach can take many different forms (Decabooter et al., in press). In this study a multifaceted perspective on the role of a data coach is presented by interviewing international academic experts in the field of data use and conducting focus groups with practitioners such as school leaders, teachers and educational support staff. The focus is on the perceived benefits and pitfalls of the different data coach profiles and how they contribute to supporting data use. The results show that experts highlight the importance of coaching skills of a data coach, whereas practitioners prefer a hands-on and practical approach. There are also some similarities between these two groups regarding the combination of an internal-external position.

Differentiating homework from the perspective of Swiss secondary teachers
Keywords: Qualitative Methods, Secondary Education, Teacher Professional Development, Teaching Approaches
Presenting Author: Christine Feiss, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Gerda Hagenauer, University of Salzburg, Austria; **Co-Author:**Sandra Moroni, Universitiy of teacher education Bern, Switzerland

Homework is a common practice in many schools. It has been shown that a crucial aspect for the effectiveness of homework is its quality (e.g. Rosário et al., 2018). One aspect of quality is fit, which for most students can only be achieved with differentiated homework. However, it has been found that few teachers give differentiated homework (Hascher & Hofmann, 2008, 2011), although they are aware that differentiation is a quality indicator for homework practice. Therefore, further research is needed that explores the question of why teachers give differentiated homework and what are possible hindering factors. Against this backdrop, the present study investigates whether teachers use differentiation measures regarding homework and if so, which ones (RQ1). Furthermore, it is investigated which arguments and challenges the teachers express regarding differentiation of homework (RQ2). Finally, it is explored what conditions for success the teachers express about differentiation of homework (RQ3). Methodologically, a qualitative approach was chosen. 23 semi-structured interviews were conducted with Swiss secondary school teachers who teach German. These interviews were transcribed verbatim and analysed using structuring qualitative content analysis (Mayring, 2017). It was found that of the 23 teachers, six use strategies of differentiation when giving homework. They implement different forms of differentiation. They mention diverse arguments for differentiating in homework as well as arguments against and challenges. In relation to the third research question (RQ 3), the teachers reported on the conditions for success at the individual teacher level and at the structural level.

What competencies do teachers need to use students' perceptions of teaching quality?
Keywords: In-service Teachers, Teacher Effectiveness, Teacher Professional Development, Teaching/Instructional Strategies
Presenting Author: Lucas Silva, University of Groningen, Netherlands; **Co-Author:**Kim Schildkamp, University of Twente, Netherlands; **Co-Author:**Adrie Visscher, Univ. of Twente, Netherlands; **Co-Author:**Roel J. Bosker, Rijksuniversiteit Groningen, Dept of Education and GION, Netherlands

Supporting teachers to improve their practices is key for every educational system. Data coming from students' perceptions of teaching quality (SPTQ) can be used by teachers to improve their teaching quality. However, the use of this type of data requires a complex set of competencies called Data Literacy for Teachers. Researchers have described in general terms what competencies are needed for data use. However, these are still generally described and are not specific to SPTQ data. This article aims to identify what competencies teachers need to be able to use SPTQ data to improve their teaching quality. We first conducted a literature review. Based on this review we developed a data use cycle for SPTQ data as well as an overview of competences needed to implement this cycle. Next, by using the Delphi method, we presented to 20 research experts in data use and SPTQ this data-use cycle and a list of competencies needed for the use of SPTQ data. Our results show that experts agree with our eight-step data-use cycle to use SPTQ data, and also with 67 of the 73 competencies presented to them. During the session we will discuss this further. We will also discuss how the competencies can be distributed between teacher, community and technology, and considerations for teacher professional development. For example, the results of this study can be used to design teacher professional development programs in the use of SPTQ data.

Session A 19

22 August 2023 12:15 - 13:45
UOM_R08
Single Paper
Teaching and Teacher Education

Simulation-based Learning in Teacher Education

Keywords: Computer-supported Collaborative Learning, Higher Education, In-service Teachers, Inquiry Learning, Pre-service Teachers, Self-regulated Learning and Behaviour, Simulation-based Learning, Social Aspects of Learning and Teaching, Social Interaction, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development
Chairperson: Cris Castro, University of Birmingham, United Kingdom

Pre-service teachers practicing the ways of scaffolding self-regulated learning with simulation
Keywords: Pre-service Teachers, Self-regulated Learning and Behaviour, Simulation-based Learning, Social Interaction
Presenting Author: Piia Naykki, University of Jyväskylä, Finland; **Co-Author:**Minna Silvennoinen, Jyvaskyla University of Applied Sciences, Finland; **Co-Author:**Sirpa Laitinen-Väänänen, JAMK University of Applied Sciences, Finland; **Co-Author:**Saara Pyykkönen, University of Jyväskylä, Finland; **Co-Author:**Jenni Latva-aho, University of Jyväskylä, Finland; **Co-Author:**Heini Ikäheimo, JAMK University of Applied Sciences, Finland

The aim of the study is to explore how simulation-based learning can function as a support for learning to scaffold self-regulated learning in a teacher education context. The particular research question is how do pre-service teachers construct understanding of SRL and the ways of scaffolding SRL during small group simulation tasks? The data collection was conducted in the vocational teacher education in Finland. The participants (N = 18) were divided into small groups of 3-5 members. The groups followed structured working phases for planning, performing and reflecting simulation tasks. The video data was analysed with the AtlasTi analysis program by observing when the groups discussed cognitive, motivational, emotional, and environmental regulation (Pintrich, 2000). It was also coded when the groups discussed learners' SRL skills in general and teachers' ways of scaffolding SRL. Findings show that the pre-service teachers constructed their understanding of SRL and the ways of scaffolding SRL during the simulation task by reflecting their prior teaching experience (f = 35), SRL theory (f = 22) and their personal school experiences (f = 18). The most common way to understand SRL while planning, performing and reflecting the simulation tasks was motivational self-regulation (f = 223). The pre-service teachers also expressed cognitive self-regulation (f = 163) and emotional self-regulation (f = 95) during the simulation-based learning. The least mentioned theme was environmental regulation (f = 69). The study explores the relatively infrequently studied topic by highlighting a pedagogical view to SRL development with simulation tasks.

The differential effect of simulations on SEL among preservice, beginner, and experienced educators
Keywords: In-service Teachers, Simulation-based Learning, Social Aspects of Learning and Teaching, Social Interaction
Presenting Author: Ronen Kasperski, Gordon College of Education, Israel; **Co-Author:**Merav Hemi, Gordon Academic College, Israel

Accumulating research points to the effectiveness of clinical simulations as a means for improving educators' socio-emotional learning (SEL) competencies. The present study attempts to add to the research literature by exploring the differential effect of clinical simulations on SEL development in three professional phases: pre-service (n=134), beginners (n=43), and experienced educators (n=44). To this end, a sample of 221 educators took part in clinical simulation workshops. SEL questionnaires were administered pre- and post-simulation. Overall, results showed a time effect of the simulations on SEL, suggesting an improvement in the total SEL score of the entire sample. In addition, a time×group interaction emerged, suggesting that pre-service educators benefited from the simulations more than beginners and experienced educators in terms of the emotional sub-scale. Pre-service and beginner educators also benefited more than experienced educators in terms of the social sub-scale. One exception was the cognitive sub-scale, where all groups reported the largest improvement. The contribution of clinical simulations to the development of SEL competencies is discussed with regard to each professional development stage, its potentials and challenges.

Professional inquiry in teacher education: Positioning student teachers as co-developers
Keywords: Inquiry Learning, Pre-service Teachers, Simulation-based Learning, Teacher Professional Development
Presenting Author: Birgitte Lund Nielsen, VIA University College, Denmark; **Co-Author:**Anja Madsen Kvols, VIA University College, Denmark

Research is presented from the Danish LULAB-initiative where student teachers and teacher educators are involved in professional inquiry projects. The aim is to examine in what ways the participation contributes to teacher educators' experience of professional agency and what kinds of practices of participation and cooperation the initiative enables for the student teachers. Multiple qualitative data is analyzed in a process of reflexive thematic analysis. Findings show that teacher educators experience elements of agency in LULAB. Furthermore, they refer to being positioned as competent professionals and they emphasise that the professional inquiry approach is giving them a possibility to contribute with practitioner research close to their teaching. Their professional identity as teacher educators is in flux. The experimental approach is also positively acknowledged by the student teachers. Data indicates a complex pattern across projects in the roles given and taken by the student teachers. In general, they value being positioned as co-developers, and they emphasize relations with the teacher educators, being listened to and taken seriously as (future) professionals. Hence, the possibilities teacher educators are given through the approach to organizational development appears to be mirrored in the way they position the student teachers and, furthermore, student teachers to a higher degree position themselves as students instead of pupils, indicating development of professional teacher identity.

Analyzing the potential of interdisciplinary collaborative diagnosing in a school context
Keywords: Computer-supported Collaborative Learning, Higher Education, Pre-service Teachers, Simulation-based Learning
Presenting Author: Amadeus J. Pickal, University of Hildesheim, Germany; **Co-Author:**Katharina Engelmann, Universität Hildesheim, Germany; **Co-Author:**Birgit J. Neuhaus, LMU Munich, Germany; **Co-Author:**Raimund Girwidz, LMU Munich, Germany; **Co-Author:**Christof Wecker, Universität Hildesheim, Germany

The potential of collaborative diagnoses – i.e. diagnoses of students' skills that are generated by teachers in collaboration – is still largely unexplored. These might be particularly helpful when diagnosing cross-domain skills such as scientific reasoning. However, individuals often need support for successful collaboration, but this need may vary depending on the degree to which information is shared or distributed among collaborators. Hence, the present study investigated to what extent *collaboration* (individual vs. collaborative diagnosis), a *collaboration script* (without vs. with collaboration script) and the level of *distribution of information* (fully shared vs. distributed information) affect pre-service teachers' *diagnostic accuracy* when diagnosing scientific reasoning. In a video-based simulation setting, 194 pre-service teachers composed diagnoses of a student's scientific reasoning skills – first individually and subsequently in dyadic collaboration. A 2x2x2 mixed design with *collaboration* as a within-subjects factor and *collaboration script* and *distribution of information* as between-subjects factors was implemented. Collaboration had not statistically significant main effect on diagnostic accuracy, but collaboration was beneficial when supported by means of a collaboration script. Further analyses will elucidate how collaboration scripts can improve pre-service teachers' interactions during their collaborative diagnostic activities and whether or not they can create a lasting positive effect.

Session A 20

22 August 2023 12:15 - 13:45
UOM_A05
Single Paper
Assessment and Evaluation, Learning and Instructional Technology, Teaching and Teacher Education

Collaborative Knowledge Construction with the Use of Technology

Keywords: Artificial Intelligence, Assessment Methods, Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Educational Technologies, Higher Education, Knowledge Construction, Pre-service Teachers, Problem Solving, Social Interaction
Interest group: SIG 01 - Assessment and Evaluation, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Florentine Hickethier, Friedrich-Schiller-University Jena, Germany

Socioemotional interaction and co-construction of knowledge in online synchronous teacher education
Keywords: Computer-supported Collaborative Learning, Knowledge Construction, Pre-service Teachers, Social Interaction
Presenting Author: Auli Lehtinen, Department of Teacher Education, University of Jyväskylä, Finland; **Co-Author:**Piia Naykki, University of Jyväskylä, Finland; **Co-Author:**Emma Kostiainen, Department of Teacher Education, University of Jyväskylä, Finland

The pandemic has accelerated societal and educational changes related to digital technologies and online interaction. More research is needed on understanding and developing pedagogical support for socioemotional interaction and knowledge construction in online synchronous higher education and in teacher education (TE). This case study analyzed how pre-service subject teachers engaged in socioemotional interaction and socially constructed knowledge in an online synchronous TE course. Additionally, the study investigated pre-service teachers' conceptions about the quality of interaction in online TE. Two small groups (n=4 and n=5 and a teacher educator) were analyzed. Data consisted of screen recorded Zoom breakout rooms (166 min) and questionnaire and interview responses from the same pre-service teachers. The study builds on a socio-constructivist theory and previous work on collaborative learning and interaction analysis examining social construction of knowledge online. The latter views collaborative interaction as progressing from lower to higher levels of thinking. Data were analyzed by content and interaction analysis. Results indicate that most discourse was at the level of sharing information or opinions and at the level of negotiating meaning and co-construction. Only a small percentage of talk reached the highest levels of synthesis, application, or metacognitive statements. Results are largely similar to those from asynchronous text-based online interaction. One group reached higher levels only after the visit by the teacher educator. Groups differed in their ways of showing active listening and humor and discussing about experiences outside the shared context. Implications, e.g., favorable scaffolding strategies, will help design for quality blended learning.

Signs of self-organization in technology-mediated knowledge co-creation
Keywords: Artificial Intelligence, Computer-supported Collaborative Learning, Educational Technologies, Knowledge Construction
Presenting Author: Niina Halonen, University of Helsinki, Finland; **Co-Author:**Kirsti Lonka, University of Helsinki, Finland

When adapted creatively, socio-digital technologies offer new collaborative affordances which promote the strands of modern learning theories (Wise & Schwarz, 2017). Similarities can be found when modern learning theories and system theories are compared and analyzed next to each other (Ståhle et al., 2020). Group of students and technology-enhanced learning context can be seen to represent one unit, a system. Like modern view of learning is recognized as collaborative and iterative processes, in the theory of self-organizing systems iteration is seen as a power center of the whole system. In this study, we used the systems theories approach when we analyzed technology-mediated knowledge co-construction. The participants were eight student teachers in mathematics and natural sciences. Pedagogical design of knowledge co-construction followed Engaging Learning Model (Lonka, 2018) in three phases 1) Activation 2) Learning 3) Evaluation. Technology used in co-construction was novel, voice-driven software, which produced visual artifacts from oral discussions. Data included videos and audio recordings. In this qualitative study, a thematic and content analysis were used with descriptive analysis. Results showed that voice-

driven technology triggered signs of system's self-organization in groups' co-construction. Exchange of information, "entropy levels", were increased. Also "chaos zone" were reached. New knowledge was classified and evaluated, and the process resulted as a "new order". Technology can be seen as an interactor which scaffolded the self-organization and transformation towards group's collaborative identity.

Fostering computer-supported collaboration knowledge and interaction through scripting and awareness
Keywords: Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Educational Technologies, Problem Solving
Presenting Author: Isis Tunnigkeit, Ruhr University Bochum, Germany; **Co-Author:**Sebastian Strauß, Ruhr-University Bochum, Germany; **Co-Author:**Julia Eberle, Ruhr-Universität Bochum, Germany; **Co-Author:**Arlind Avdullahu, Ruhr-University Bochum, Germany; **Co-Author:**Nikol Rummel, Ruhr University Bochum, Germany

Collaboration scripts and group awareness tools are two promising approaches to improve students' knowledge about collaboration and their collaborative processes. While scripts offer learners guidance by prompting specific interactions, awareness tools guide learners tacitly by increasing their awareness of information relevant to the collaboration. In this study, we compare which approach is more effective in fostering knowledge about successful collaborative problem-solving processes and the quality of students' interactions. In a laboratory study with 156 learners, we provided groups with either an external collaboration script during collaborative problem-solving, a group awareness tool with guided reflection on their collaborative performance, or no support. We assessed individual knowledge about collaboration and the groups' quality of interaction. Results show that the group awareness tool with reflection as well as the external script positively influenced participants' knowledge but not the quality of their interaction in a post-intervention collaboration phase. The effect of the group awareness tool on students' knowledge is higher than that of the collaboration script.

Supporting student teachers' reflection through assessment: the case of reflective podcasts
Keywords: Assessment Methods, Cooperative/Collaborative Learning, Higher Education, Pre-service Teachers
Presenting Author: Laura Ketonen, University of Jyväskylä, Finland; **Co-Author:**Juuso Henrik Nieminen, The University of Hong Kong, Finland

Research on teacher education has noted how tricky it is to support student teachers' reflection through assessment. In this case study, we examine how a novel assessment task, podcasts, can promote reflection. Students (N = 14) produced podcasts in groups based on their course literature. Using qualitative content analysis and reflexive thematic analysis, we analyzed podcasts, group discussions on the podcast process, and individual student interviews. The podcast task was noticed to engender reflection. Three theory-driven themes were analyzed to both promote and hinder reflection: experientiality, digitally mediated authenticity, and communality. We propose that these elements of assessment foster reflection, calling for greater attention to how assessment and grading support and hinder student teachers' reflection.

Session A 21

22 August 2023 12:15 - 13:45
UOM_R09
Single Paper
Higher Education, Teaching and Teacher Education

Researchers' Education, Perceived Competence and Communication with Practitioners

Keywords: Assessment Methods, Communication Skills, Communities of Learners and/or Practice, Competencies, Cooperative/Collaborative Learning, Doctoral Education, Higher Education, Instructional Design, Mixed-method Research, Primary Education, Quantitative Methods, Researcher Education, Synergies between Learning / Teaching and Research, Teacher Professional Development
Interest group: SIG 04 - Higher Education, SIG 14 - Learning and Professional Development, SIG 17 - Methods in Learning Research, SIG 24 - Researcher Education and Careers
Chairperson: Angeliki Lithoxoidou, University of Western Macedonia , Greece

Validation of a Questionnaire for Measuring Perceived Research Competence
Keywords: Assessment Methods, Competencies, Doctoral Education, Researcher Education
Presenting Author: Sarah Marrs, Virginia Commonwealth University, United States; **Co-Author:**Carla Quesada-Pallarès, Universitat Autònoma de Barcelona, Spain; **Co-Author:**Korinthia D. Nicolai, School of Education, Virginia Commonwealth University, United States; **Co-Author:**Elizabeth A. Severson-Irby, School of Education, Virginia Commonwealth University, United States; **Co-Author:**Jose Reinaldo Martinez-Fernandez, Universitat Autònoma de Barcelona, Spain

Graduates of doctoral (Ph.D.) programs are expected to be competent at designing and conducting research independently. Given the level of research competence needed to successfully conduct research, it is important that assessors of doctoral programs (e.g., faculty and staff) have a reliable and validated tool for measuring and tracking perceived research competence among their students and graduates. A high level of research competence is expected for all Ph.D. graduates worldwide, in addition to in all disciplines/fields. Moreover, graduates of Ph.D. programs may complete their studies in one country but then obtain a research position in another country, emphasizing the need to ensure that all doctoral programs are fostering similar levels of research competence. Thus, the purpose of this study was to gather additional evidence for validity and reliability of the Research Competence (R-Comp) scale (Böttcher & Thiel, 2018). Specifically, we sought to extend the findings of Böttcher and Thiel (2018) by adapting the scale, translating it to other languages, and applying the tool with a sample of early stage researchers. Our findings provide initial evidence that the adapted PR-Comp is appropriate for use in three languages (Catalan, English and Spanish) and across a variety of disciplines/programs of study.

Development and Evaluation of a Science Communication Training for Master Students in STEM
Keywords: Communication Skills, Competencies, Instructional Design, Researcher Education
Presenting Author: Julian Fick, TU Braunschweig, Germany; **Co-Author:**Noemi Kumpmann, University of Muenster, Germany; **Co-Author:**Friederike Hendriks, TU Braunschweig, Germany

Communication skills are essential outcomes of higher education (Ritchie, 2022). However, the necessary science communication competencies are rarely covered in professional training programs (Ritchie et al., 2022) and existing training programmes often are insufficiently or not at all evaluated (Baram-Tsabari & Lewenstein, 2017). Therefore we developed and evaluated an evidence-based training program based on a constructive alignment approach. The training's effectiveness was assessed using a pre-post summative evaluation design and a comprehensive definition of communication competencies.
After participating in our manual-based training, the 16 German STEM master students showed increased knowledge and self-efficacy, more positive attitudes towards science communication as well as high satisfaction with the training. Coding video recordings of short presentations to compare their actual behavior before and after the training revealed an increase in involvement strategy, but not credibility strategy usage. The comprehensibility which was assessed using a syntax-based algorithm, did not increase either.
One of the major limitations of our study refers to the behavioral assessment which was done rather coarse. Additionally, the relationship between single strategy usage and overall communication success is discussed.

Baram-Tsabari, A., & Lewenstein, B. V. (2017). Science communication training: What are we trying to teach? International Journal of Science Education, 7(3), 285–300.Ritchie, T. S., Rossiter, D. L., Opris, H. B., Akpan, I. E., Oliphant, S., & McCartney, M. (2022). How do STEM graduate students perceive science communication? Understanding science communication perceptions of future scientists. PLOS ONE, 17(10).

PhD supervisors' and supervisees' perceptions on supervisory support
Keywords: Doctoral Education, Higher Education, Mixed-method Research, Researcher Education
Presenting Author: Henrika Anttila, University of Helsinki, Finland; **Co-Author:**Kirsi Pyhältö, University of Helsinki, Finland; **Co-Author:**Lotta Tikkanen, University of Helsinki, Finland

Supervisory relationship is a highly significant driver of doctoral experience. However, empirical studies exploring the alignment between supervisors' and supervisees' perceptions of good doctoral supervision is lacking. A total of 768 doctoral candidates and 561 doctoral supervisors from a multi-field research-intensive university participated in the study. Data were collected with the doctoral experience survey and the supervisory experience survey, and qualitatively and quantitatively analysed using a mixed methods approach. The results showed that both doctoral candidates and the supervisors described *informational support, emotional support, instrumental support, and co-constructional support* as the primary characteristics of high-quality supervision. However, some differences also existed. Furthermore, their perceptions regarding frequency of supervision are well aligned, although supervisors report supervising slightly more than candidates report receiving it. The results highlight the importance of promoting the alignment between doctoral candidates' and supervisors' perceptions of quality and quantity of supervision, as it fosters study progress, reduces the risk of candidates dropping out and increases satisfaction.

From findings to impact: Implications of current research for researcher-practitioner communication
Keywords: Communities of Learners and/or Practice, Primary Education, Synergies between Learning / Teaching and Research, Teacher Professional Development
Presenting Author: Paul Howard-Jones, University of Bristol, United Kingdom; **Co-Author:**Bethany Woollacott, Loughborough University, United Kingdom; **Co-Author:**Samuel Sims, University College London, United Kingdom; **Co-Author:**Korbian Moeller, Loughborough University, United Kingdom; **Co-Author:**Hugo Lortie-Forgues, Loughborough University, United Kingdom; **Co-Author:**Matthew Inglis, Loughborough University, United Kingdom; **Co-Author:**Tim Jay, Loughborough University, United Kingdom; **Co-Author:**Camilla Gilmore, Loughborough University, United Kingdom; **Co-Author:**Colin Foster, Loughborough University, United Kingdom

Experience tells us that the development of high-quality, research informed, rigorously evaluated resources for teachers does not guarantee the successful translation of educational research into practice. The journey from findings and resources to student learning is influenced by, amongst other factors, how these are communicated to teachers. Such communication may benefit from current understanding of the 'mechanisms' underlying effective professional development, but also depend on the emotional responses of practitioners to concepts and forms of messaging, the impact of findings on teachers' existing views and beliefs, the processes by which teachers communicate between themselves and adapt new ideas in their practice, and a range of sociocultural factors arising from the complex situation of classroom teaching within a given sociocultural environment. Here, we draw together diverse empirical findings to identify key insights from the research literature that may have general implications for researcher-practitioner communication, with a particular focus on barriers and enablers for mathematics education in the Early Years.

How does interdisciplinary doctoral experience matter?
Keywords: Cooperative/Collaborative Learning, Doctoral Education, Quantitative Methods, Researcher Education
Presenting Author: Auli Toom, University of Helsinki, Finland; **Co-Author:**Lotta Tikkanen, University of Helsinki, Finland; **Co-Author:**Henrika Anttila, University of Helsinki, Finland; **Co-Author:**Kirsi Pyhältö, University of Helsinki, Finland

Interdisciplinarity has been a buzz-word in research policy and research funding calls for a while. Engagement in interdisciplinary research is expected to result solutions to tricky challenges, promote scientific breakthroughs and enhance researcher career opportunities. It has also suggested to provide a measure for researcher quality and impact. Yet, empirical evidence on the influences of engaging in interdisciplinary research, particularly on early career researcher experience, is still limited. We aim to contribute to bridging the gap in the literature by exploring PhD candidates' involvement in conducting interdisciplinary research and whether having such experience is related to having experience in national and international research collaboration, and time-to-candidacy. Altogether 768 PhD candidates from a multidisciplinary research-intensive university participated in the study. Results showed that 39% of the participants had experience in interdisciplinary research. Having such experience was less common in health sciences than in other disciplinary fields. The PhD candidates with interdisciplinary research experience reported having more diverse experience in international collaboration compared to those candidates without interdisciplinary research experience. The candidates with inter-disciplinary experience estimated to take considerably longer time to complete their doctoral studies than those without such experience. Results imply that engagement in cross-disciplinary research has pros and cons from both PhD candidate and doctoral education system perspective.

Session A 22

22 August 2023 12:15 - 13:45
UOM_R04
Poster Presentation
Cognitive Science, Higher Education, Instructional Design, Learning and Special Education, Motivational, Social and Affective Processes

Writing and Literacy Development

Keywords: Assessment Methods, Bilingual Education, Cognitive Skills and Processes, Higher Education, Instructional Design, Mathematics/Numeracy, Motivation, Primary Education, Quantitative Methods, Reading, Secondary Education, Self-regulated Learning and Behaviour, Teaching Approaches, Teaching/Instructional Strategies, Writing/Literacy
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 12 - Writing
Chairperson: Torhild Høydalsvik, Volda University College, Norway

Teaching writing in primary schools: the impact of curricula and orthographies. A systematic review
Keywords: Primary Education, Teaching Approaches, Teaching/Instructional Strategies, Writing/Literacy
Presenting Author:GIULIA VETTORI, University of Florence, Italy; **Co-Author:**Julie Dockrell, Institute of Education, United Kingdom

Our understanding of teachers' writing practices are limited by a focus on teachers teaching in English and a lack of a systematic comparison across national curricula. A systematic review was completed to explore writing practices in primary schools focussing on the impact of the curriculum and orthography. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement (Moher et al., 2009) and the EPPI-centre (Gough et al., 2017) were followed. Inclusion and exclusion criteria were defined to capture relevant empirical studies. Following an initial review of the literature, key terminology was collated. The key search terms "teaching", "writing" and "primary school" were used and criteria were specified for age range, context, language of instruction and writing components. Initial hits from the databases included publications from PubMed, Web of Science, and Scopus. Data extraction included (1) whether writing models underpin reported teaching practices, which components of the writing process teachers focus on; (2) which strategies are reported to be used by teachers, how they are operationalized and their frequency of use; and (3) which aspects of the teaching of writing vary across different languages and national educational curricula.

A genre-based interconnected reading and writing instruction: effects on writing skills
Keywords: Instructional Design, Reading, Secondary Education, Writing/Literacy
Presenting Author: Moniek Vis, Rijksuniversiteit Groningen, Netherlands; **Co-Author:**Amos van Gelderen, University of Amsterdam / Rotterdam University of Applied Sciences, Netherlands; **Co-Author:**Kees de Glopper, University of Groningen, Netherlands; **Co-Author:**Jacqueline van Kruiningen, Rotterdam University of Applied Sciences, Netherlands

Reading and writing skills are highly interconnected (e.g. Fitzgerald & Shanahan, 2000). Meta-analyses suggest that reading skills benefit from writing instruction and vice versa, and that both reading and writing skills benefit from balancing reading and writing instruction (Graham & Hebert, 2011; Graham et al., 2018a; Graham et al., 2018b). However, there seems to be little research on the effects of interconnected reading and writing instruction (IRWI).
We defined interconnected reading and writing instruction as instruction in both skills aiming at elements that connect them according to functional and (socio-)cognitive models of reading and writing, explicitly addressing relationships between reading and writing. Genre is a core element of IRWI. The aim of our research is to test whether genre-based interconnected reading and writing instruction improves reading and writing skills.
Two genre-based lesson series focusing on news articles and columns respectively were implemented in three Dutch secondary schools. Eight participating

teachers were randomly assigned to the two conditions. For both conditions, two distinct genre elements were the focus of instruction. The column and news article group function as each other's control group. All students took the same pre- and posttests.
Writing assignments were rated using a benchmark procedure (pretest and posttest) and genre characteristics were analytically rated (posttest). Multilevel analyses with these scores on the posttest writing assignments as dependent variables showed significant effects of pretest scores on posttest scores. However, condition did not explain differences in posttest scores which is in contrast to previously found results on reading posttests.

Bilingual adults learning written words in English: orthographic influences of the first language.
Keywords: Bilingual Education, Quantitative Methods, Reading, Writing/Literacy
Presenting Author: Alexia Antzaka, Universidad Internacional de la Rioja-UNIR, Spain; **Co-Author:**Tianjiao Li, University of Bangor, United Kingdom; **Co-Author:**Mina Jevtović, Basque Center on Cognition, Brain and Language-University of the Basque Country, Spain; **Co-Author:**Clara Martin, Basque Center on Cognition, Brain, and Language- Basque Foundation for Science (Ikerbasque), Spain

When learning novel written words monolingual English children rely on larger units compared to monolingual Italian children, thus boosting their word learning performance (Marinelli et al., 2020). Relying on larger units has been related to reading experience in a deep (e.g., English or French) as compared to a shallow (e.g., Italian or Spanish) orthography not only in word learning but also in monolingual reading (Ziegler & Goswami, 2005). In bilinguals, the size of the units used in reading is influenced by both their orthographies. Thus, bilinguals knowing one language with a deep orthography rely on larger units compared to bilinguals knowing two languages which both have shallow orthographies, even when reading in their shallow-orthography (Lallier & Carreiras, 2018). The present study tests whether similar differences can be observed when bilinguals learn written words in the same, second language (English) because of differences in the orthographic depth of their first language (either Spanish-shallow or French-deep). Sixty adult participants were tested online (30 Spanish-English, 30 French-English bilinguals). Participants were taught 24 English-like novel written words with either inconsistent or consistent rhymes. We hypothesised that French-English bilinguals would: a) rely on larger orthographic units thus learning more novel words, b) perform equally well on consistent and inconsistent items due to their greater experience with spelling inconsistencies. Our preliminary results demonstrate that while both bilingual groups learnt a similar number of words, the Spanish-English bilinguals performed worse on the inconsistent items while the French-English bilinguals performed, as expected, equally well.

Executive Functions in School Achievement: The Mediational Role of Learning-Related Behavior
Keywords: Cognitive Skills and Processes, Mathematics/Numeracy, Self-regulated Learning and Behaviour, Writing/Literacy
Presenting Author:carlotta rivella, Unige, Disfor, Italy; **Co-Author:**Paola Viterbori, UNIGE, Disfor, Italy

Executive functions (EFs) have a crucial role in the transition to school. EFs are related to both academic achievement and learning-related behavior (LRB), that is the ability to adapt to the school demands in terms of concentration, compliance with rules, and autonomy. Few studies have examined EF, school performance, and LRB together, taking into account their interconnection.The aim of the present study was to investigate the mediational role of learning-related behavior in the relationship between EF and academic achievement during the primary school transition.Ninety-five first graders completed a performance-based EF assessment through working memory and inhibitory tasks. They also completed literacy and math tasks. Their teacher reported their learning-related behaviors. Results indicate that despite different patterns depending on the EF component or school performance considered, EFs are related to school achievement both directly and indirectly, through the mediational role of learning-related behavior. These findings highlight the importance of EF in early academic performance and the importance to support EF development as a beneficial part of early education curriculum and a target for early intervention for a successful transition to school.

Assessing writing motivation: A systematic review of K-5 students' self-reports
Keywords: Assessment Methods, Motivation, Primary Education, Writing/Literacy
Presenting Author: Aline Alves-Wold, University of Stavanger, Norway; **Co-Author:**Bente Walgermo, University of Stavanger, Norway; **Co-Author:**Erin McTigue, University of Stavanger, Norway; **Co-Author:**Per Henning Uppstad, Norwegian Reading Center, Norway

For attaining success in writing, motivation is essential. Crucially, instruction is dependent on knowing the student's capabilities and inner drives. To date, research on writing has yet to establish a consistent framework for assessing writing motivation, and often fails to acknowledge students' self-reports, rather favoring evaluations of students' writing motivation made by others, such as teachers and researchers. This limbo state originates partly from a general skepticism towards the trustworthiness of elementary students' self-reports. Nonetheless, the validity of such self-reports has been acknowledged in adjacent fields, such as reading. Aiming to establish a knowledge base from studies addressing students' voices, the present study adopts the method of a systematic review and investigates how writing motivation has been assessed in empirical studies (1996-2020) through K-5 students' self-reports. Of the 7,047 studies identified through database search, 56 met the inclusion criteria and are examined in this review. Results indicate that (a) *storytelling* is the genre most used to operationalize writing in the investigations, (b) surveys and interview questions measuring students' *attitude* towards writing are the most common type of self-report used, and (c) students' voices are weighted differently across the studies. Findings suggest that future research should (1) work to counteract existing biases in writing tasks, (2) provide a rationale for their choice/design of measure of motivation, and (3) report clearly whose voices are being heard (e.g., students', teachers', or researchers') and the appropriateness of this choice regarding study purpose, design, and findings.

Moroccan EFL University Instructors' Perceptions and Self-Reported Practices on Teaching Writing
Keywords: Higher Education, Quantitative Methods, Teaching Approaches, Writing/Literacy
Presenting Author: Abderrahim Mamad, University of Szeged, Doctoral School of Education, Hungary; **Co-Author:**Tibor Vígh, University of Szeged, Hungary

The majority of students in higher education lack proficiency (e.g., in writing words correctly and distinguishing a sentence from a phrase) and encounter many obstacles in many areas of writing (e.g., grammar, vocabulary, organization, and sentence construction). This illustrates the challenging nature of the writing skill and the teachers' emphasis on the product rather than the process of writing instruction. Thus, this study aims to compare the product- and process-based approaches to writing according to English as a Foreign Language (EFL) professors' perceptions and self-reported practices. For the purpose of this exploratory quantitative study, a 42-item questionnaire was developed to collect data face-to-face and online from 51 EFL professors in Moroccan public universities. Since the questionnaire items regarding their perceptions and practices were identical and they covered five subscales which are governed by both the product and process approach to writing, comparisons could be made. The findings demonstrated that the professors agreed on the value of the subscale, engagement in the writing revision process, more than the other subscales. The professors also reported that the writing practices described in the two subscales, engagement in the writing revision process and writing as a final product, were most frequently used. Based on the comparison between the professors' perceptions and their self-reported practices, consistencies were found in all five subscales. This study not only validated the questionnaire on the two approaches to teaching EFL writing in Moroccan universities, but it also showed how university professors' perceptions and self-reported practices matched.

Session A 23

22 August 2023 12:15 - 13:45
UOM_R02
Poster Presentation
Assessment and Evaluation, Cognitive Science

Cognitive Development in Mathematics

Keywords: Anxiety and Stress, Cognitive Development, Cognitive Skills and Processes, Creativity/Divergent Thinking, Early Childhood Education, Eye Tracking, Gender Issues, Learning Approaches, Mathematics/Numeracy, Misconceptions, Mixed-method Research, Quantitative Methods
Interest group: SIG 03 - Conceptual Change, SIG 05 - Learning and Development in Early Childhood, SIG 27 - Online Measures of Learning Processes
Chairperson: Ka Lok Cheng, The University of Hong Kong, Hong Kong

Development of Creative Thinking via Fractions and Rhythm
Keywords: Cognitive Development, Creativity/Divergent Thinking, Learning Approaches, Mathematics/Numeracy
Presenting Author: Libby Azaryahu, The Academic College Levinsky Wingate, Israel; **Co-Author:**Orit Broza, Levinsky College of Education, Israel; **Co-Author:**Shai Cohen, Bar-Ilan University, Israel; **Co-Author:**Sara Hershkovitz, Levinsky College of Education, Israel; **Co-Author:**Esther Adi-Japha, Bar-Ilan University, Israel

The present study examines the effectiveness of learning fractions and rhythm using explicit instruction and its impact on the creative thinking of 4th graders (N=86) in both math and music. For the purpose of the study, an intervention program was used focusing on creative thinking of fractions and rhythm. Three classes received identical MusiMath instruction that explicitly links math and music. These classes received additional instruction regarding patterns of creative thinking differing in focus: Creative Math class, Creative Music class, and Creative Math and Music class. The fourth class was used as a control class that learned math and music in a standard way without creative intervention. To collect the data, we developed software that enabled the students to perform musical and mathematical tasks that included questions with only one correct answer, and questions that invited original and varied answers that encouraged creative thinking. Pre- to post-intervention analyses indicated that the experimental groups outperformed the control group on fractions and rhythm. All experimental groups developed their creative thinking in both math and music with an advantage to the Creative math and music class.

Children's mathematical anxiety in primary school: The role of sex, age, and spatial ability
Keywords: Anxiety and Stress, Cognitive Development, Gender Issues, Mathematics/Numeracy
Presenting Author: Wenke Möhring, University of Basel, Switzerland; **Co-Author:**Leonie Moll, University of Basel, Switzerland; **Co-Author:**Marta Szewczyk, The John Paul II Catholic University of Lublin, Poland; **Co-Author:**Magdalena Szubielska, The John Paul II Catholic University of Lublin, Poland

Several students suffer from mathematical anxiety in school, and thus experience strong, negative emotions in mathematics education. In the present study, we aimed to investigate whether math anxiety can already be measured in primary school, whether there are any age- and sex-related differences, and whether spatial skills (mental rotation, spatial scaling) would mediate the potential relation between sex and children's math anxiety. A sample of 6- to- 8-year-old children (N = 168) took part in two spatial tasks (assessing mental rotation and spatial scaling), solved several mathematical problems, and were asked about their mathematical attitudes and anxiety using acknowledged questionnaires. Our findings suggest a sex difference with girls showing higher math anxiety and lower attitudes even shortly after entering primary school (see Fig. 1). However, this relation between sex and math anxiety was not mediated by spatial skills (see Fig. 2) which contrasts several recent adult studies. Therefore, it seems that spatial skills (and spatial anxiety) may mediate the relation between sex and math anxiety in adult samples, whereas the same does not hold for primary school children. Differential mechanisms across age and educational implications will be discussed.

Eye-tracking for investigating students' local vs. global view of data
Keywords: Cognitive Skills and Processes, Eye Tracking, Mathematics/Numeracy, Mixed-method Research
Presenting Author: Saskia Schreiter, University of Education Heidelberg, Germany; **Co-Author:**Markus Vogel, Heidelberg University of Education, Germany

Distribution comparisons are a central component of statistics. Research showed that many students struggle to perceive a data distribution as a conceptual entity. These difficulties are reflected in students' tendency to focus on local details of the distributions (*local view of data*) rather than on differences between distributions as a whole (*global view of data*). While many authors refer to students' view of data, there is, to the best of our knowledge, no empirical study that investigated students' actual viewing behavior when comparing distributions. The central assumption of this study was that specific eye-tracking measures constitute indicators for the perceiving and processing of local vs. global distributional features. For this purpose, hypotheses for differences in certain eye-tracking measures (fixation count, saccade amplitude, saccade direction) between students with a local and global view of data were theoretically derived and empirically investigated. A methodological combination of eye-tracking and stimulated recall interviews was used to collect data from 25 6th graders. In line with expectations, students with a global compared to a local view of data had on average significantly fewer fixations, longer saccade amplitudes and a higher relative number of horizontal saccades. These results suggest that eye-tracking can assist in identifying students' conceptions and difficulties related to a local vs. global view of data.

Individual strategies when comparing data sets with boxplots and their corresponding answer patterns
Keywords: Cognitive Skills and Processes, Mathematics/Numeracy, Misconceptions, Quantitative Methods
Presenting Author: Martin Abt, University of Education Freiburg, Germany; **Co-Author:**Timo Leuders, University of Education Freiburg, Germany; **Co-Author:**Katharina Loibl, University of Education Freiburg, Germany; **Co-Author:**Frank Reinhold, University of Education Freiburg, Germany

One main reason for errors when comparing data sets with boxplots is the counterintuitive meaning of the box area: it is inversely related to the distribution's density and *not* proportionally related to the represented part of the sample—as in other representations. We used congruent and incongruent items to investigate (N=100) whether the occurrence of an area bias depends on incomplete conceptual change. Via cluster analysis we identified a first group, who showed no area bias, a second group who systematically answered with area bias, and two other groups with intermediate knowledge—answering specific items (e.g., when comparing the salient median led to the correct answer) without area bias. The results are in line with our hypotheses: the first group, in contrast to the second group, fully completed the conceptual change necessary, and the incomplete conceptual change in the three groups with intermediate knowledge prevents the area bias only in certain tasks.
Bakker, A., Biehler, R. & Konold, C. (2005). Should young students learn about box plots? In G. Burill & M. Camden (Eds.),*Curricular development in statistics education* (pp. 163–173). ISI.Lem, S., Onghena, P., Verschaffel, L. & Van Dooren, W. (2013): The heuristic interpretation of box plots.*Learning and Instruction*, *26*, 22–35. https://doi.org/10.1016/j.learninstruc.2013.01.001.Vosniadou, S., & Skopeliti, I. (2013). Conceptual Change from the Framework Theory Side of the Fence. *Science & Education*, *23*(7), 1427–1445. https://doi.org/10.1007/s11191-013-9640-3.

Evidence that retrieval of multiplication facts requires inhibitory control
Keywords: Cognitive Development, Cognitive Skills and Processes, Mathematics/Numeracy, Quantitative Methods
Presenting Author: Joanne Eaves, Nottingham University, United Kingdom; **Co-Author:**Camilla Gilmore, Loughborough University, United Kingdom; **Co-Author:**Lucy Cragg, University of Nottingham, United Kingdom

Previous research has demonstrated that inhibitory control skills have a role in mathematics performance. However, the mechanism(s) underlying this relationship are currently unclear. We used an experimental approach to test the proposal that inhibitory control is required when retrieving multiplication facts to resolve interference between related facts. For example, for the multiplication problem '6 × 7', some people might incorrectly answer '48' because it is the correct answer to the neighbouring multiplication problem '6 × 8'. In an online experiment with 450 adult participants, we interleaved trials of established inhibitory control tasks (number or animal Stroop) and a multiplication retrieval task. We found that congruency effects were influenced by the nature of the previous trial, indicating that inhibitory control transferred between trials, and therefore between tasks. This reveals that inhibitory control is involved when resolving interference between related multiplication facts. The nature of the Stroop task did not affect the transfer of inhibitory control, demonstrating that the inhibitory control mechanisms involved were not context-specific but domain-general in nature. Our findings suggest that retrieving knowledge of multiplication facts might be difficult for some individuals not because they lack mathematical knowledge of those facts, but because they have insufficient inhibitory control or a difficulty deploying inhibitory control., As a result, they might struggle to overcome the interference between neighbouring multiplication facts.

Investigation of the Number Sense and Cognitive Flexibility Levels of Preschool Children Aged 5-6
Keywords: Cognitive Development, Cognitive Skills and Processes, Early Childhood Education, Mathematics/Numeracy
Presenting Author:Gürsu Asik, Bahcesehir University, Turkiye; **Co-Author:**Asli Gokdag, Ministry of Education - Turkey, Turkiye

This study has been designed to investigate cognitive flexibility and number sense levels of preschool children aged 5-6. While focusing mainly on the relationship between number sense and cognitive flexibility of preschool children, the study also attempts to examine the effect of demographic factors such as parents' level of education, gender, and number of siblings on the improvement of those two skills. To this end, "Dimensional Change Card Sorting" task and

“Number Sense Brief” were used respectively to measure the level of cognitive flexibility and the ability to use and understand numbers.A total of 100 children from two different public kindergartens participated in the study. Data was collected in 30-minute one-on-one sessions with each child. Independent-sample t-tests, one-way ANOVA and correlation analyses were carried out to investigate the relationship among the variables. It has been found that while there are significant statistical differences between children’s cognitive flexibility and number sense in favor of educated parents, no such difference was observed for gender variable. As for the number of siblings, statistical difference does not exist for cognitive flexibility; however, there seems to be a statistically significant difference as far as number sense is concerned. It has further been understood that there is a significant positive correlation between number sense and cognitive flexibility. The study contributes to our understanding of the role of cognitive flexibility and number sense in the development of 5-6 year-old early-school age children and provides further research suggestions.

Session A 24

22 August 2023 12:15 - 13:45
UOM_R03
Poster Presentation
Assessment and Evaluation, Higher Education, Instructional Design, Teaching and Teacher Education

Critical Thinking and Problem Solving

Keywords: Cognitive Skills and Processes, Competencies, Cooperative/Collaborative Learning, Creativity/Divergent Thinking, Critical Thinking, Digital Literacy and Learning, Game-based Learning, Higher Education, Instructional Design, Metacognition, Mixed-method Research, Problem Solving, Problem-based Learning, Reasoning, Teaching/Instructional Strategies
Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 14 - Learning and Professional Development
Chairperson: Christopher Neil Prilop, Aarhus University, Denmark

Metacognition, creativity, and critical thinking reflect in PBL-based teaching performances
Keywords: Creativity/Divergent Thinking, Critical Thinking, Metacognition, Problem-based Learning
Presenting Author: Rotem Maor, David Yellin College of Education, Israel; **Co-Author:**Nurit Paz-Baruch, Bar Ilan University, Israel; **Co-Author:**Niv Grunspan, Bar Ilan University, Israel; **Co-Author:**Alex Milman, Bar-Ilan University, Israel; **Co-Author:**Zemira Mevarech, Bar-Ilan University, Israel; **Co-Author:**Rotem Levi, Bar Ilan University, Israel; **Co-Author:**Sarit Shlomo, Bar Ilan University, Israel; **Co-Author:**Michal Zion, Bar-Ilan University, Israel

The integration of 21st-century skills (e.g., critical thinking, communication, collaboration, and metacognition) in teaching is essential for the quality of education and to prepare students for the challenges of 21st-century skills. One teaching method that can improve these skills among students is project-based learning (PBL). However, teachers themselves should be proficient in these skills to achieve this goal. The present study focuses on three skills: metacognition, creativity, and critical thinking, which are considered cognition-related 21st-century skills; integrating them in PBL settings may improve teaching and learning performances. This study aims to examine whether and in what way there are relationships between components of metacognition, creativity, and critical thinking in self-reported teaching performances in PBL settings. To examine the research question, we analyzed 29 journals in which teachers described a project they had planned, which was carried out by students using a mixed method design model. We used a self-reported teaching performance index developed for this study. The results show significant associations between metacognition, creativity, and critical thinking and revealed that these correlations are reflected the most in projects engaging in environmental issues. These results emphasize the importance of metacognition, creativity, and critical thinking combination in PBL settings that can be employed to improve teaching and learning processes and underpin the connection between 21st-century skills and environmental education.

Personal Data Literacy Empowerment: A theoretical framework
Keywords: Competencies, Critical Thinking, Digital Literacy and Learning, Instructional Design
Presenting Author: Eleni Kyza, Cyprus University of Technology, Cyprus; **Co-Author:**Andria Agesilaou, Cyprus University of Technology, Cyprus

Children while exploring the digital environment, leave digital traces behind, and are often exposed to data disclosure requests from commercial parties. Commercial organizations collect and analyze children’s data to gain insights on their online activities and preferences to create user profiles, which in turn are used to provide targeted ads and services. However, children are reported to have difficulties in identifying and understanding the techniques of data harvesting or acknowledging the value of their data. In addition, evidence shows that if they understand to some extent these issues, they do not know how or are not willing to employ strategies to protect their personal data. In other cases, children choose to disclose rather than to protect their personal data in favor for incentives and prizes. Scholars have advocated that to protect children’s data rights and increase their agency in the data economy, children should be empowered to develop the necessary knowledge and competencies to recognize the data mining practices and effectively respond to them. Aiming to address this challenge, this article focusing on children and youth, proposes the “Personal Data Literacy Empowerment” framework, which contains the following steps: Data visualizations and representations; Awareness of data privacy, data ownership, and data mining issues; Deeper understanding of the data mining industry; Questioning the data mining practices and one’s own data contributions; and Behavior change and adoption of resilient practices. The article concludes by discussing implications of this framework for future education and research around the area of children’s understandings of personal data.

Effects and experiences from playing a game against disinformation in different classroom settings
Keywords: Cognitive Skills and Processes, Critical Thinking, Game-based Learning, Mixed-method Research
Presenting Author: Thomas Nygren, Uppsala University, Sweden; **Co-Author:**Carl-Anton Werner Axelsson, Uppsala University, Sweden; **Co-Author:**Jon Roozenbeek, University of Cambridge, United Kingdom; **Co-Author:**Sander van der Linden, University of Cambridge, United Kingdom

This study investigates how the Bad News game can be implemented in classroom settings and to what extent it has an impact on students' skills to evaluate digital misinformation. In a quasi-experimental design, with 771 upper secondary school students from Sweden, we also investigate to what degree this game may have an impact upon students’ constructive attitudes - namely positive attitudes towards access to reliable news without fostering overconfidence. We find that the overall effect size across three conditions (playing individually, in pairs or competing with the class) was *d*=.30 which is similar to previous studies using Bad News (e.g., Roozenbeek & van der Linden, 2019). We also find that students in the more competitive class condition perceived the educational intervention as more interesting and fun than students in other educational settings. The correlation between self-rated internet skills and their actual skills to assess misinformation in the post-test indicates that the education intervention did not boost students’ overconfidence. Students made more considerations about the design of misinformation after the intervention, suggesting that the game may be especially useful to play with students who are unaware of online misinformation strategies.

Using reflection to analyse student insights of critical & creative thinking skill development
Keywords: Creativity/Divergent Thinking, Critical Thinking, Problem Solving, Teaching/Instructional Strategies
Presenting Author: Kelly Benati, Monash University, Australia; **Presenting Author:**Jacqueline O'Toole, Monash University, Australia; **Co-Author:**Francesco Interrigi, Monash University, Australia; **Co-Author:**paul murphy, Monash University, Australia

Businesses are calling for business graduates who can think critically and creatively to develop innovative solutions to business problems. It has been identified that there are several different forms of graduate capital associated with employability and career success (Tomlinson, 2017), which all reinforce the requirement for critical and creative thinking skills. However, it has been suggested that the higher education system is not effectively teaching or cultivating these in their future graduates. Students also expect to acquire general and social skills, attitudes, and broader abilities as well as discipline specific knowledge (Nicolescu et.al., 2009), however there is limited information regarding their understanding of the skills and abilities they will need obtain to ensure their future career success. This research evaluates the students’ perceptions and understanding of their learning of critical and creative thinking while working in teams to

develop sustainability solutions for a selected organisation. It aims to better comprehend students' insights regarding the meaning and relevance of critical and creative thinking as an important employability attribute, while ascertaining appropriate pedagogies for enabling this learning.

Learning of working life competencies through collaborative problem-solving in higher education
Keywords: Competencies, Cooperative/Collaborative Learning, Higher Education, Problem Solving
Presenting Author: Niina Impiö, University of Oulu, Finland; **Co-Author:**Signe Siklander, University of Oulu, Finland; **Co-Author:**Bhavna Rawat, University of Oulu, Finland

As working life follows in a continuum from education, working life and education should not be dissected separately (Lucas & Unwin, 2009). Universities are often accused of neglecting the idea that higher education (HE) should lay a path to the workplace (Tynjälä et al. 2016). In our master's degree programme, we educate experts in the field of learning, education and technology, and the students are expected to excel at various working life situations in their future work. Therefore we focus on enhancing competences of collaboration and co-operation as well as problem-solving in our study context. Aim of our study is to dissect from students' perspective which working life competences they have learnt during the collaborative problem-solving process. International HE students (N=53) took part in the study, which took place within the four courses (each 10 ects). The courses were planned in accordance with a pedagogical design of collaborative problem-solving (CPS) (Author, Author, & Author, 2021). Theoretically it relies on the learning sciences, specifically on collaborative learning and co-regulation of learning. The data was collected by online questionnaires and responses for open questions were analyzed thematically. The results reveal that the development of students' working life competencies through CPS process is the combination of four aspects: students' skills *(social skills, cognitive skills, technical skills, problem-solving)*), will (*motivation for learning, emotional skills, ownership for own learning)*), attitudes (*open for collaboration, open mindedness, valuing of ongoing learning*) and knowledge (*learning theories, awareness of own competencies and 21st century skills, technological knowledge*).

Do students in different courses of study think the same way in complex problem solving?
Keywords: Cognitive Skills and Processes, Higher Education, Problem Solving, Reasoning
Presenting Author: Gyöngyvér Molnár, University of Szeged, MTA-SZTE Digital Learning Technologies Research Group, Hungary; **Co-Author:**Hao Wu, University of Saint Joseph, Macao

This study aims to identify the similarities and differences in the thinking of students in different courses of study while they solve complex problems (CPS). Participants (N=852) were freshers in four faculties (medicine, the humanities, economics and the sciences) at a large Hungarian university. CPS, inductive reasoning (IR) and combinatorial reasoning (CR) were assessed. Results indicated large differences in CPS, IR and CR skills between the students in different courses of study. Path analyses models demonstrated that the students in the various faculties typically think differently in a CPS environment. That is, IR and CR showed different effects on their CPS skills. This study contributes to our understanding of the nature of CPS and identifies the differences in the way of thinking between students in various courses of study.

Session A 25

22 August 2023 12:15 - 13:45
UOM_R01
Poster Presentation
Cognitive Science, Motivational, Social and Affective Processes

Achievement and Cognitive Skills and Processes

Keywords: Achievement, Cognitive Skills and Processes, Competencies, E-learning/ Online Learning, Educational Neuroscience, Emotion and Affect, Knowledge Construction, Meta-analysis, Problem Solving, Quantitative Methods, Science and STEM, Science Education, Secondary Education, Self-concept
Interest group: SIG 03 - Conceptual Change, SIG 08 - Motivation and Emotion, SIG 22 - Neuroscience and Education
Chairperson: Catherine Gabelica, France

Social, Dimensional, and Temporal Comparison Effects on Students' Self-Concepts: A Meta-Analysis
Keywords: Achievement, Cognitive Skills and Processes, Competencies, Self-concept
Presenting Author: Fabian Wolff, Universität of Koblenz, Germany; **Co-Author:**Jens Möller, Kiel University, Germany

The 2I/E model provides a framework to examine the joint effects of social, dimensional, and temporal comparisons on students' subject-specific academic self-concepts. To date, it has been tested in 12 empirical studies. However, integration of these findings is lacking. We therefore conducted an individual participant data meta-analysis, in which we reanalyzed the data used in all prior 2I/E model studies (N = 45,248). This meta-analysis provided strong support for the 2I/E model: There were moderate social comparison effects, small to moderate dimensional comparison effects, and small temporal comparison effects on students' math and verbal self-concepts. Moreover, several moderating variables affected the strength of these effects. However, all moderating effects were small in size.

Academic Buoyancy and Coping: Are Buoyant Students Using More Effective Coping Strategies?
Keywords: Achievement, Cognitive Skills and Processes, Emotion and Affect, Secondary Education
Presenting Author: Tahrim Hussain, Liverpool John Moores University, United Kingdom; **Co-Author:**Dave Putwain, Liverpool John Moores University, United Kingdom; **Co-Author:**Martin Daumiller, University of Augsburg, Germany; **Co-Author:**Reinhard Pekrun, University of Essex, United Kingdom

Academic buoyancy is defined as the ability to bounce back from academic setbacks and minor academic adversities, including the pressure of taking examinations. It would be expected for academic buoyancy to show positive relations with adaptive coping. Although previous studies have shown small or negligible relations, they have used a limited range of coping strategies to measure relations with academic buoyancy. The present study aims to examine the relations between academic buoyancy and a more extensive repertoire of nine coping strategies used by upper secondary students when an examination did not go as well as hoped for. The participants were 535 upper secondary students (male = 138, female = 376) with a mean age of 16.4 years (SD= .52). Academic buoyancy was measured using the Academic Buoyancy Scale. Coping was measured using the Cognitive Emotion Regulation Questionnaire.Academic buoyancy showed positive correlations with positive refocusing, refocus on planning, positive re-appraisal, and putting into perspective, and negative correlations with acceptance, self-blame, rumination, and catastrophising. Regressions showed Academic buoyancy was a statistically significant positive predictor of academic achievement, over and above coping. Network analysis showed academic buoyancy was situated closely and positively to putting into perspective and positive reappraisal and negatively to catastrophising and other-blame. In contrast to earlier studies, academic buoyancy was related to coping strategies. Cognitive strategies to perceive difficult situations as something to learn from and put into perspective, along with taking personal responsibility, are key in building buoyant students who can cope with academic adversities.

Effects of Executive Function Training in Children and Adolescents: a Meta-Analysis
Keywords: Achievement, Cognitive Skills and Processes, Educational Neuroscience, Meta-analysis
Presenting Author: Sophie McMullin, Université du Québec à Montréal (UQAM), Canada; **Co-Author:**Steve Masson, Université du Québec à Montréal (UQAM), Canada

Executive functions (EFs) are top-down control mechanisms that enable goal-directed behavior (Miyake & Friedman, 2012). They include working memory, inhibitory control, and cognitive flexibility. These cognitive processes have been linked to academic success (Bowmer *et al.*, 2018). As a result, many researchers have sought to develop EFs training. However, the results are inconsistent across studies. The problem lies in the likelihood of observing transfer, i.e. the influence of past learning on current or future learning (Perkins et Salomon, 1992). Typically, in the field of cognitive training, only near transfer is observed, i.e. transfer occurs when the training and assessment tasks are somewhat similar, and far transfer, when the tasks are dissimilar, seems more elusive (Sala & Gobet, 2017). However, this ignores other conceptualizations of transfer, and then potentially masks effects of cognitive training. Considering this point, we therefore used a detailed taxonomy of transfer (Barnett and Ceci, 2002) to realize a meta-analysis combining 103 studies of various cognitive trainings with neurotypical children and adolescents aged 3 to 18 years. Our results show that working memory seems to be the EF that benefits most from cognitive training,

regardless of the training goal. Furthermore, we observed that long delays between training and assessment, as well as substantial modifications of the social context between training and assessment, seemed to impair transfer. These results offer new perspectives on the effects of cognitive training. More importantly, they propose a new way to analyze of cognitive training studies.

A preliminary study of the brain activation during science problem solving using MEG method
Keywords: Cognitive Skills and Processes, E-learning/ Online Learning, Problem Solving, Science Education
Presenting Author: Fang-Ying Yang, National Taiwan Normal University, Taiwan

The purpose of the study was to explore the brain activation during science problem solving before and after a computerized learning task by using Magnetoencephalography (MEG) which is a neuroscience tool measuring the magnetic fields produced by brain's electrical currents. A computerized learning program on the topic of “Moon Phases” was developed as the instructional intervention. To assess conceptual understanding, we constructed two tests with multiple-choice questions as pre- and post-tests. Twenty-six university students were paid to participate in the study. They were asked to do pretest in the MEG system, and then play with the learning program. Afterward, they did post-test in the MEG system again. Participants were grouped into successful and unsuccessful problem solvers according to their test result. Brain activation was indicated by the normalized powers of brain waves (alpha & beta waves) and connectivity between different brain regions. *T*-test was applied for group comparisons while correlation analysis was used to examine the brain connectivity. It was found that when learners answered different types of test items, different patterns of brain activation appeared. Most students who succeeded in the post test showed a tendency of reduction in their brain activation when solving simple items but the activation became stronger when solving the complex ones. Meanwhile, the connectivity between brain regions decreased in the post-test.

The Impact of Executive Functions on Physics Learning in Secondary School Students.
Keywords: Cognitive Skills and Processes, Quantitative Methods, Science Education, Secondary Education
Presenting Author: Konstantinos G Tsigaridis, University of Cambridge, Greece; **Co-Author:**Rui WANG, University of Cambridge, China; **Co-Author:**Jiayin Zheng, University of Cambridge, UK, United Kingdom; **Co-Author:**Michelle Ellefson, University of Cambridge, United Kingdom

Physics is one of the fundamental science domains in secondary education. Teachers raise concerns about the insufficient development of physics skills in high-school students. Hence, it seems essential to investigate the possible impact of cognitive skills, in this case, executive functions, on physics learning. Recent findings suggest that executive functions correlate with physics learning. However, it seems important for research in cognitive psychology and science education to investigate if these correlations are differentiated in dependence on students’ engagement with physics courses. As such, we administered a battery of executive function skills and physics learning tasks to a sample of 15- to 17-year-old students from Greece (N = 403, M_{age} = 15.78 years, SD_{age} = 0.74). For science students (they select to attend extra courses in physics), we noticed that executive function skills and physics learning share strong correlations. In contrast, executive function skills seem to have less significant links with physics learning for non-science students (no extra courses for physics). These findings highlight the importance of including students’ engagement with physics courses when examining the links between executive functions and physics learning. Thus, it seems essential for further research to explore the complex cognitive processes underlying secondary physics learning. Results from such studies can, in the long run, lead to breakthrough physics curricula for enhancing students’ physics skills.

Biology Education Levels and General Cognitive Ability Influence Conceptual Learning of Biology
Keywords: Cognitive Skills and Processes, Knowledge Construction, Quantitative Methods, Science and STEM
Presenting Author: Rui WANG, University of Cambridge, China; **Co-Author:**Konstantinos G Tsigaridis, University of Cambridge, Greece; **Co-Author:**Aidan Feeney, Queen's University Belfast, United Kingdom; **Co-Author:**Michelle Ellefson, University of Cambridge, United Kingdom

One obstacle to conceptual learning in science is intuitive theory. Recent work indicates that intuitive theories coexist with rather than being replaced by the correct scientific theories during the process of conceptual learning in science. Hence, transitioning from intuitive theories to scientific theories is complex, as it requires the efficient suppression of intuitive theories while accessing and applying scientific theories. Recent findings suggest that executive functions and science education experience are associated with people’s ability to suppress intuitions about science. Although it is known that general cognitive ability shares reliable links both with executive functions and science education experience, few studies have examined the influence of general cognitive ability on the suppression of intuitions about science. Thus, in this study, we investigated the role of general cognitive ability and biology education experience in intuition suppression in a sample of adult students (N = 262, M_{age} = 23.45 years, SD_{age} = 6.53 years). We administered two biology tasks consisting of items to which intuitive and formal scientific theories gave consistent or inconsistent answers. General cognitive ability was significantly associated with people’s accuracy and response time when solving counterintuitive biology questions. Moreover, biology education experience was positively associated with students' accuracy rather than response time. These results shed light on the links between general cognitive ability, science education experience and processes of conceptual learning in science.

Session A 26

22 August 2023 12:15 - 13:45
UOM_GYM
Roundtable
Learning and Instructional Technology, Teaching and Teacher Education

Teacher Professional Development

Keywords: Attitudes and Beliefs, Conceptual Change, In-service Teachers, Mindsets, Pre-service Teachers, Qualitative Methods, Reading, Secondary Education, Teacher Professional Development, Teaching Approaches, Well-being
Interest group: SIG 11 - Teaching and Teacher Education, SIG 17 - Methods in Learning Research
Chairperson: Sonja Hahn, Germany

Longitudinal changes in teachers’ attitudes towards innovations in implementation processes
Keywords: Attitudes and Beliefs, Conceptual Change, Reading, Teacher Professional Development
Presenting Author: Mareike Ehlert, University of Muenster, Germany; **Co-Author:**Elmar Souvignier, University of Muenster, Germany

Implementing evidence-based innovations in everyday school practice requires favourable attitudes by teachers, such as their perception of an innovation’s acceptability and feasibility. It is likely that teachers’ attitudes change at different moments in the implementation process, e.g., when teachers gain first experiences with an innovation in practice. As a consequence, the support teachers receive in the implementation process should be geared to these experienced changes. This study therefore aims at exploring significant attitudinal changes in teachers’ acceptability and feasibility before, during and after implementing an innovation. N = 68 primary school teachers currently participate in a professional development programme on a differentiated reading intervention. From January to July 2023, they will implement the prepared reading material into their classroom. Teachers’ acceptability and feasibility of the reading material will be assessed (1) after a teacher training that precedes classroom implementation, (2) two months after implementing the material, and (3) at the end of the school year. To investigate if teachers’ acceptability and feasibility towards the innovation change over time, an ANOVA will be conducted. The direction of these changes will be examined exploratively. Understanding the dynamics of teachers’ attitudes will provide information about when teachers need additional support in implementation processes.

Experiential learning as a means for personal development and wellbeing in Slovak teachers
Keywords: Mindsets, Teacher Professional Development, Teaching Approaches, Well-being
Presenting Author: Lenka Janik Blaskova, University of Exeter, United Kingdom

Thirty years ago, Slovakia became an independent, democratic country, but schooling and teacher training practice have not catch up with the needs and trends of 21st century education. A substantial educational reform has not taken place, and 19 changes in the ministers of education post have not allowed for any

long-term strategy implementation. In 2021, teachers revealed alarming rates of perceived stress (95%) and 25% perceived school atmosphere as harmful to their mental health. Private and the third sector offer workshops and short-term programs to improve the mental health of teachers. However, it is not clear how evidence-based and effective these programs are.In response, an international pilot involves the co-creation and delivery of experiential learning, targeting the personal development and wellbeing of Slovak teachers. Using cultural-historical activity theory (CHAT), it examines how participating teachers might respond to well-established training methods developed by the Social and Health Education Project in the Republic of Ireland. The pilot sets the ground for further work on developing an evidence-based nationwide curriculum aiming to promote socio-emotional competencies in Slovak teachers and children.This roundtable discussion seeks to understand how we can assist teachers in developing 21st century skills that we ask them to support in children and young people. How feasible is it to adapt a western-based curriculum on personal development to traditional education? Can co-creation of the curriculum support teachers in becoming aware of and getting equipped to support societal change? The researcher will reflect on the initial phase of the pilot.

Mapping the quality of teacher learning during lesson study: a digital ethnographic perspective
Keywords: In-service Teachers, Qualitative Methods, Secondary Education, Teacher Professional Development
Presenting Author: Katelijne Barbier, University of Antwerp, Belgium; **Co-Author:**Elke Struyf, University of Antwerp, Belgium; **Co-Author:**Ellen Vandervieren, University of Antwerp, Belgium; **Co-Author:**Vincent Donche, University of Antwerp, Belgium

In this study we aim to examine the quality of teacher learning, when mapped using an ethnographic research tool, called Ethos. This digital app enables us to map teacher learning experiences online and in situ. Using the framework of teacher learning patterns, making empirically based distinctions between reproduction oriented, meaning oriented and survival oriented teacher learning, we aim to unravel the distinct quality of learning experiences when teachers participate in a lesson study. Lesson study is a professional development method in which teachers work in groups and are actively and repeatedly stimulated to reflect upon their teaching practices. In this study, 16 mathematics teachers (grades 7 to 10) divided in 7 teacher teams, conduct 2 lesson studies in their classrooms. A rich experience sampling data stream is collected in a longitudinal way by using the Ethos app. In this app, teachers will receive a repeated set of open and closed questions during both lesson studies. In addition, they will have the opportunity to share multimedia content related to their entire learning trajectory. This study can provide important insights for theory development on the quality of teacher learning during lesson study or more broadly, when teachers participate in more long term active and collaborative professional development activities. If the qualitative results are enriching, it can also point at the added value of using digital ethnographic research tools and experience sampling, to map teacher learning in situ.

'Stories to live by' in early career teachers' professional identity development
Keywords: In-service Teachers, Pre-service Teachers, Qualitative Methods, Teacher Professional Development
Presenting Author: Gonny Schellings, Eindhoven University of Technology, Netherlands; **Co-Author:**Douwe Beijaard, Eindhoven University of Technology, Netherlands

'Stories to live by' pertain to dominant conceptions of teaching and learning in a school and affect a teachers' professional identity. Developing a professional identity is a key element of beginning teachers' growth. The current study analyzes the 'stories to live' by of 56 early-career teachers by identifying themes that may direct their reflection on the professionals they are and want to become. Stories assigned to certain themes seemed to have more impact on teachers' professional identity than stories associated with other themes. The round table will present some exemplar stories, highlight the different themes and discuss how peer discussions about 'stories to live by' reach deep reflection on beginning teachers' professional identity.

Session A 27

22 August 2023 12:15 - 13:45
UOM_A07
Workshop
Teaching and Teacher Education

Instrumental Enrichment thinking skills program

Keywords: Cognitive Skills and Processes, Dialogic Pedagogy, Metacognition, Reasoning
Interest group:

The goal of the workshop is to introduce the participants to the theory and practice of the thinking skills program called "Instrumental Enrichment" (IE) and offer them hands-on experience with some of the IE tasks. Rather than being taught frontally, the IE program is implemented in the classroom via a dialogical mediated learning technique. The main objective of this technique is to shift the emphasis from the "products" to the process of learning and problem-solving. Using the IE program as an example the workshop participants will be encouraged to discuss the advantages and disadvantages of "stand-alone" cognitive programs vs. cognitive infusion into curricular subjects. In addition, the participants will discuss the research demonstrating that the IE program proved to be effective also in changing the teachers' own cognitive and problem-solving skills. The workshop participants will work with two types of IE tasks – perceptual "Organization of Dots" and more conceptual "Comparisons" and review the possibilities of transferring the target cognitive skills to various curricular areas.

Instrumental Enrichment thinking skills program
Presenting Author: Alex Kozulin, Achva College and Feuerstein Institute, Israel

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Session A 28

22 August 2023 12:15 - 13:45
UOM_A11
ICT Demonstration
Educational Policy and Systems

Calibration of an Academic Analytics Tool for At-Risk Students Policy in Higher Education

Keywords: Assessment Methods, At-risk Students, Educational Policy, Learning Analytics
Interest group: SIG 04 - Higher Education

Please bring your own device if you are attending this ICT demonstration.Learning and academic analytics have become crucial tools in higher education policy. While learning analytics provides feedback for the individual student, academic analytics entails data tools that influence and support policy. Using design-based research with data simulation techniques, this EARI-ICT-demonstration aims at describing a calibration process, and showcasing how an academic analytics tool can be used to better understand why at-risk students have a higher chance of failing in high-selection freshman years. Using four different case studies using simulated data, we detail the strengths and limits of such an academic analytics tool for both course level and program level educational policy creation and monitoring.

Calibration of an Academic Analytics Tool for At-Risk Students Policy in Higher Education
Presenting Author: David Corradi, University of Antwerp, Belgium

Please bring your own device if you are attending this ICT demonstration.Learning and academic analytics have become crucial tools in higher education policy. While learning analytics provides feedback for the individual student, academic analytics entails data tools that influence and support policy. Using design-based research with data simulation techniques, this EARI-ICT-demonstration aims at describing a calibration process, and showcasing how an academic analytics tool can be used to better understand why at-risk students have a higher chance of failing in high-selection freshman years. Using four different case studies using simulated data, we detail the strengths and limits of such an academic analytics tool for both course level and program level educational policy creation and monitoring.

Session B 1

22 August 2023 15:00 - 16:30
AUTH_CH
Invited Symposium
Cognitive Science, Instructional Design

Synthesizing Cognitive Load and Self-Regulated Learning: Four years of EFG MRE Research

Keywords: Cognitive Skills and Processes, Instructional Design, Learning Strategies, Metacognition, Problem Solving, Quantitative Methods, Self-regulated Learning and Behaviour, Teaching/Instructional Strategies
Interest group: SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Anique de Bruin, Maastricht University, Netherlands
Organiser: Julian Roelle, Ruhr University Bochum, Germany
Discussant: Matthias Nückles, University of Freiburg, Germany

The Emerging Field Group 'Monitoring and Regulation of Effort' was founded in 2018 to unravel how bringing together Cognitive Load Theory and Self-regulated Learning Theory can advance our understanding of learning in contexts where managing mental effort is at stake and learners (partially) self-regulate the course of their learning. In this invited symposium, we describe state-of-the-art scientific insights related to this topic. The contributions provide a diversity of learning contexts and research questions where mental effort and self-regulation of learning interact. The contribution by Seufert and Hamm addresses the relations between task difficulty, subjective cognitive load, and learners' engagement in strategies of self-regulated learning. Waldeyer et al. examine whether in complex tasks, learners' metacognitive monitoring strategies can be supported by informing learners about how to monitor diagnostic cues before they engage with the respective tasks. In De Bruin et al. a conceptual framework on how to support self-regulation of effort when engaging with difficult but beneficial learning activities (i.e., 'desirable difficulties') is proposed. Finally, in Sidi et al., a specific type of self-regulation of effort is studied, that is, the "opt out" decision in problem-solving tasks. They consider motivational considerations, task design, and general success as moderating factors. Given the joint focus of the studies on understanding monitoring and regulation of effort as well as the methodological diversity, the symposium will point to fruitful conclusions and directions for future research concerning the self-regulation of mental effort during (complex) learning.

The interplay between Cognitive Load, learners' resources and self-regulation
Presenting Author: Tina Seufert, Ulm University, Germany; **Co-Author:**Verena Hamm, Ulm University, Germany

Self-regulated learning depends on task difficulty and accordingly learners' resources and cognitive load, as described in the model of Seufert (2018) by an inverse U-shaped relation: with easy tasks resources are high and load is low and hence there is no need to regulate, while with difficult tasks load is too high and resources too low to regulate. Only on a medium level of task difficulty learners regulate as resources and load are balanced. To validate this model, 67 participants reported their strategy use for four exams with different levels of difficulty. They specifically rated their perceived task difficulty, cognitive load, and the available resources (prior knowledge, interest, content-related self-concept). A multilevel analysis revealed an inverse U-shaped relationship between the task difficulty and the use of cognitive learning strategies. For metacognitive strategies and resource strategies, we only found a positive linear relationship. The increasing cognitive load mediates these relational patterns. The role of learners' resources as a mediator however needs further research.

Focusing Learners on Comprehension- or Performance-Based Cues in Fostering Monitoring Accuracy
Presenting Author: Julia Waldeyer, Ruhr-University Bochum, Germany; **Co-Author:**Tino Endres, University of Freiburg, Germany; **Co-Author:**Martine Baars, Erasmus University Rotterdam, Netherlands; **Co-Author:**Julian Roelle, Ruhr University Bochum, Germany; **Co-Author:**Alexander Renkl, University of Freiburg, Germany

Interventions that are intended to help students use comprehension-based cues are a promising means to enhance monitoring accuracy in learning from texts. Theoretically, emphasizing comprehension-based cues when acquiring problem-solving skills should also be beneficial. However, it is also conceivable that performance-based cues might be similar or even more effective than comprehension-based cues when acquiring problem-solving skills. To investigate the effects of focusing learners on comprehension- or performance-based cues in acquiring problem-solving skills, we conducted two experiments in mathematics. In Experiment 1 ($N = 135$), we found that focusing students on performance-based cues yielded higher monitoring accuracy. This effect occurred regardless of whether students were informed about the to-be-monitored cues before they engaged in problem-solving. In Experiment 2 ($N = 268$), we found that providing students who were focused on comprehension-based cues caught up with their counterparts when they additionally received instruction on how to use the respective cues and were engaged in self-explanation activities during problem solving. For students who were focused on performance-based cues, these support measures did not entail beneficial effects. We conclude that in acquiring problem-solving skills, focusing learners on comprehension-based cues is less effective than focusing learners on performance-based cues unless learners additionally receive guidance concerning the monitoring process and are engaged in comprehension-focused learning activities.

Self-regulating Effort towards Desirable Difficulties: A Conceptual Framework
Presenting Author: Anique de Bruin, Maastricht University, Netherlands; **Co-Author:**Felicitas Biwer, Maastricht University, Netherlands; **Co-Author:**Luotong Hui, Imperial College London, United Kingdom; **Co-Author:**Erdem Onan, Maastricht University, Netherlands; **Co-Author:**Louise David, Maastricht University, Netherlands; **Co-Author:**Wisnu Wiradhany, Bina Nusantara University, Indonesia

Desirable difficulties are learning conditions that are often experienced as effortful, but have a positive effect on learning results and transfer of knowledge and skills (Bjork & Bjork, 2011; Bjork, 1994). Learners often do not appreciate the beneficial effects of desirable difficulties, and the negative experiences of high effort and perceived low learning make them resistant to engage in desirable difficulties (Biwer et al., 2020a). This ultimately limits learning outcomes and academic achievement. With the increasing emphasis on self-regulation in education, characterized by higher learner agency and abundant choices in what, when, and how to study, the field of educational psychology is in need of theoretical and empirically testable assumptions that improve self-regulation in desirably difficult learning conditions with the aim to foster self-regulation abilities, learning outcomes, and academic achievement. Here, we present a framework that describes how to support self-regulation of effort when engaging in desirable difficulties; the 'Start and Stick to Desirable Difficulties (S2D2)' framework. The framework builds on the Effort Monitoring and Regulation Model (de Bruin et al., 2020). The aim of this framework is (1) to describe evidence for the central role of perceived effort and perceived learning in (dis)engagement in desirable difficulties, and (2) to review evidence on, and provide an agenda for research to improve learners' self-regulated use of desirable difficulties to help them start and persist when learning feels tough, but is actually effective.

Opting out leveraging strategic effort regulation
Presenting Author: Yael Sidi, the Open University of Israel, Israel; **Co-Author:**Rakefet Ackerman, Technion - Israel Institute of Technology, Israel

Effort regulation is the basis for effectively engaging in cognitive tasks in diverse work, daily life, and educational contexts. This regulatory process is at the core of research on self-regulation, and has received much attention in both metacognitive theory and Cognitive Load Theory. Such research on self-regulation of effort in problem-solving tasks has mostly used forced-response paradigms, in which participants must provide concrete solutions, even when having low confidence in the chance to succeed. However, in real life, people often opt out. Basic research has demonstrated that opting out can be an effective strategy

that improves success rates in responses chosen to be provided. However, research into opting out utilization is nascent. In the present study, we used multiple-choice analogies, a verbal problem-solving task, to shed more light on opting out while considering motivational considerations, task design, and general success in the task as moderating factors. Findings demonstrate that having the option to opt out can generally benefit problem-solving outcomes even for weak performers. They also expose the roles of motivation scheme and task design for optimizing these effects.

Session B 2

22 August 2023 15:00 - 16:30
UOM_CH
Invited Symposium
Learning and Social Interaction

Social Presence and Telepresence in Online Social Learning

Keywords: Computer-supported Collaborative Learning, E-learning/ Online Learning, Social Aspects of Learning and Teaching, Social Interaction
Interest group:
Chairperson: Emmy Vrieling, Open University of the Netherlands, Netherlands
Organiser: Karel Kreijns, Open University of the Netherlands, Netherlands
Organiser: Derya Orhan Göksün, Turkiye
Organiser: Kamakshi Rajagopal, Belgium
Organiser: Maartje Peters, Open University of the Netherlands, Netherlands
Organiser: Joshua Weidlich, German Institute for International Educational Research (DIPF), Germany
Discussant: Armin Weinberger, Saarland University, Germany

While online social learning allows for time and place independence, it is at the same time more difficult to support the learning process because of transactional distance (Moore, 2013) and psychological distance (Trope & Liberman, 2010). These distances give a feeling of isolation with negative consequences for social interaction and thus on social learning. Social presence and telepresence are seen as concepts that help to bridge psychological distance. Social presence is the feeling that distant others are ‘transported' to you whereas telepresence is the feeling of your ‘transportation' to others (e.g., in the remote or virtual environment). It is, however, unclear what the role of telepresence alongside social presence in online social learning is and how both presences reinforce each other. During this symposium we will involve the participants in a *World Café setup* to explore and discuss how social presence and telepresence may impact online communication, collaboration and social interaction. The output will further determine our EFG research agenda. In groups, facilitated by one of us, the following focus areas will be probed: (1) Human interaction; (2) Modes of communication; (3) Data driven regulation; and (4) Supporting technologies. The abstracts below each describe one of the focus areas.

Human interaction
Presenting Author: Karel Kreijns, Open University of the Netherlands, Netherlands

(Online) social learning builds on human interaction, which, as a joint transactive activity among two or more humans, is multilayered and complex. In addition to the contents of speech, face-to-face communication also includes nonverbal aspects like intonation, articulation, rhythm, and pitch. Beyond auditory features, nonverbal aspects of communication also include facial expressions, gestures, posture, and much more. These latter features are often referred to as social cues, which are processed by humans as part of social cognition (Bandura, 1992; Frith, 2008). When we learn with others, representations of our peers are guided by the development of schemas, attributions, and stereotypes (Uleman & Kressel, 2013), influencing rapport, emotions, and motivations toward our communication partner, with important downstream effects for social learning.Experiences of social presence and telepresence, as emergent phenomena of human communication, be it in virtual reality or text-based communications, are similarly determined by socio-cognitive and socio-emotional processes (Kreijns & Kirschner, 2018; Weidlich & Bastiaens, 2022). For example, we form impressions of our conversation partners using social cues over time (Walther, 1992). When social cues are sparse, for example in text-based communication, we infer and generalize from minuscule social signals (Bacev-Giles & Haji, 2017), sometimes incorrect and guided by stereotypes (Fiske & Taylor, 2013), with important implications for how social learning unfolds online. Robust investigations into online social learning must build on these established research lines from social psychology, cognitive science, and communication research and extend them to account for social presence and telepresence experiences.

Data driven regulation
Presenting Author: Derya Orhan Göksün, Adiyaman University, Turkiye

The concept of “data-driven” for educational systems refers to the use of data and evidence to inform and guide educational decision-making and practice (Zeide, 2017). It can involve collecting and analyzing data on various aspects of education, such as student learning, teacher effectiveness, and course performance, and using the insights gained from some analysis (especially learning analytics) to inform decisions about lots of processes such as instructional methods, curriculum development, and designing interaction of education. These design processes can be named as data-driven regulation (Cooper, 2007; Kurilovas, 2020). Data-driven regulation in distance learning can be a valuable tool for ensuring that online education programs are effective and meet the needs of students. In addition, the data shows more than learning and can be received via distance learning environments easily. Data-driven regulation is important for supporting social presence and telepresence in distance learning because it allows educators and regulators to collect and analyze data on student performance and engagement in order to identify areas where improvements can be made (Levin & Datnow, 2012; Zhu, 2018). For example, if data shows that students are struggling to connect with their peers or teachers in a distance learning environment, regulators can use this information to identify strategies for improving social presence and telepresence. By gathering data on student performance and engagement, regulators can also identify best practices and successful strategies for supporting social presence and telepresence in distance learning programs.

Supporting technology
Presenting Author: Kamakshi Rajagopal, AE - Adapt & Enable, Belgium; **Presenting Author:**Maartje Peters, Open University of the Netherlands, Netherlands

Technology can be used to improve social presence and telepresence in distance learning environments to enhance feelings of connectedness and engagement. Teachers can encourage students to use chat platforms, messaging features, social media or other online platforms to create groups or forums where students can discuss course material, ask questions, and share resources (Branon & Essex, 2001; Clark, 2020; Rice, 2016). This can foster a sense of community and support among students.Teachers can also use video conferencing tools such as Zoom, Skype, Teams or Google Meet to organize virtual class sessions. This allows students to see and hear their classmates and the teacher and can help to create a sense of connection and engagement (Clark, 2020). If teachers encourage students to use their webcam or microphone during virtual class sessions, this can enhance social presence and engagement (Zhang et al., 2022). Besides these communication systems, online tools such as Google Docs or Trello can provide students with opportunities to collaborate on projects or assignments. This can help to foster a sense of teamwork and cooperation. Consider using virtual reality or other immersive technologies to create a more interactive and engaging learning experience for students. Overall, it's important for teachers to be proactive in creating a sense of connection and community among students in a distance learning environment, and to use technology to facilitate peer interaction and teacher/student interaction because the regulation of these forms of interaction do not occur naturally (Vrieling-Teunter et al., 2022).

Modes of communication
Presenting Author: Joshua Weidlich, German Institute for International Educational Research (DIPF), Germany

In a technology-rich world, human relations are increasingly mediated through the interfaces of our digital devices. Accelerated by COVID-19, this now applies to the educational sector more than ever before (Bond et al., 2021). While increasingly sophisticated communication technologies may coax our senses, an important fact remains that mediated communication changes the availability of social cues, impacts processes of social cognition and, thus, has interpersonal

ramifications. Invoking the concepts of telepresence and social presence is an attempt to better understand how this affects online social learning. Due to this shift, different modes of communications in educational contexts have proliferated, e.g., fully online and blended/hybrid modes, asynchronous and synchronous methods, text-based, video-based, videoconference, and, increasingly, augmented and virtual reality. Importantly, a deficit-model of mediation is unproductive, in which face-to-face communication is considered the gold standard and we only begrudgingly make use of technology-mediated alternatives for their practical benefits, mainly independence of time and place (Hodges et al., 2020). Decades of research have accumulated to support the notion that mediated communication indeed can bring particular challenges, but it is not per se deficient; It is qualitatively different and can also bring unique possibilities. Social presence and telepresence, albeit influenced by affordances of communication media (Weidlich & Bastiaens, 2019), emerges in the first instance *between humans*. Although it can appear organically over time, it can also be fostered deliberately, and there is a multitude of influencing factors, not least the expectations and desires of the communicating person (Weidlich et al., 2022).

Session B 3

22 August 2023 15:00 - 16:30
AUTH_T002
Symposium
Teaching and Teacher Education

Applying the Theory of Planned Behavior in Inclusive Education

Keywords: Attitudes and Beliefs, In-service Teachers, Inclusive Education, Self-efficacy, Teacher Efficacy, Teaching Approaches, Teaching/Instructional Strategies
Interest group: SIG 15 - Special Educational Needs
Chairperson: Olli-Pekka Malinen, University of Helsinki, Finland
Organiser: Olli-Pekka Malinen, University of Helsinki, Finland
Discussant: Tuomo Virtanen, University of Jyväskylä, Finland

The theory of planned behavior (TPB) has been used across various domains to predict and understand human behavior. The key concept of the TPB is behavioral intention that is influenced by attitude toward the behavior, perceived behavioral control (self-efficacy), and subjective norm concerning the behavior (Ajzen & Kruglanski, 2019). Inclusive education means that teachers in various countries, are now required to provide quality education for increasingly diverse learners in their classrooms. This symposium will feature four papers which all apply the TPB in the context of inclusive education by studying teachers in three countries.
Paper 1 studies teacher intentions and behavior related to differentiated instruction by using survey and observation data from 180 teachers in the Netherlands. Paper 2 investigates the relationships between sources of self-efficacy, attitudes toward inclusive education, self-efficacy, and inclusive behavior with survey data from 656 teachers in Eastern Finland. Paper 3 will test a TPB-based structural equation model by using survey data from approximately 700 teachers in Southern Finland. Paper 4 utilizes survey data from 290 German teachers to investigate how inclusive practices are explained by their self-efficacy, and intentions to implement inclusive education. The four papers of the symposium offer mutually complementing and theoretically founded perspective to teacher intentions and behavior to implement inclusive practices in their classrooms.Reference Ajzen, I., & Kruglanski, A. W. (2019). Reasoned action in the service of goal pursuit. *Psychological review*, *126*(5), 774.

Differentiated teacher practices in secondary education: Planned or improvised behavior?
Presenting Author: Elisa Kupers, University of Groningen, Netherlands; **Co-Author:**Anke de Boer, University of Groningen, Netherlands; **Co-Author:**Lisette de Jonge-Hoekstra, University of Groningen, Netherlands; **Co-Author:**Alexander Minnaert, University of Groningen, Netherlands

A cornerstone of inclusive education is teachers' ability to respond adequately to different educational needs of students in their diverse classroom. Differentiated instruction is a means to meet the educational needs of students of different ability. For teachers, however, differentiation is also a highly complex skill that requires careful and pro-active preparation of lessons. This makes teachers' intentions with regards to differentiated instruction particularly relevant. In two studies, we looked at teachers' intentions from different perspectives. In study A, a cross-sectional study where teachers (*n*=180) filled out an online questionnaire, we examined whether teachers' intentions to differentiate could best be predicted with regression models based on either the Self-determination theory (SDT), or the Theory of Planned Behavior (PBT). Both the SDT model as well as the TPB model significantly predicted teachers' intentions (p

Sources of teacher self-efficacy in inclusive education within the framework of the TPB
Presenting Author: Akie Yada, University of Jyväskylä, Finland; **Co-Author:**Olli-Pekka Malinen, University of Helsinki, Finland; **Co-Author:**İpek Gülsün, University of Jyväskylä, Finland; **Co-Author:**Hannu Savolainen, University of Eastern Finland, Finland

Teachers' attitudes and self-efficacy in inclusive education are perhaps the most frequently addressed factors in previous literature for implementing inclusive education. Recently, there has been an increasing number of studies investigating the two constructs within the framework of the theory of planned behavior (TPB) that posits a coherent model for understanding of an individual's attitudes and behavior (Ajzen & Madden, 1986). This study aims to investigate the role of sources of self-efficacy (Bandura, 1997) in the light of the TPB. The data were gathered from 656 Finnish in-service teachers. An electronic survey was conducted to collect data regarding teachers' attitudes, self-efficacy, sources of self-efficacy, and behavior (their self-perceived inclusive practices). The results of structural equation modeling indicated that mastery experience is the only predictor of teacher self-efficacy among the four sources of self-efficacy. In addition, teacher self-efficacy mediated the effect of mastery experience on behavior. The finding suggests that supporting teachers' positive mastery experience in inclusive practices is crucial for developing teachers' self-efficacy, which in turn enhances their inclusive behavior.

Finnish teachers' intentions and inclusive behaviours via the theory of planned behaviour
Presenting Author:İpek Gülsün, University of Jyväskylä, Finland; **Co-Author:**Hannu Savolainen, University of Eastern Finland, Finland; **Co-Author:**Olli-Pekka Malinen, University of Helsinki, Finland; **Co-Author:**Akie Yada, University of Jyväskylä, Finland

Inclusive education is one of the most significant educational reforms in Europe and around the world. Teachers' attitudes toward inclusive education, their self-efficacy for inclusive practices, their subjective norms, and their intentions in implementing inclusive education are considered to play a key role in the implementation of successful inclusion. Therefore, this study aims to examine in-service teachers' intentions in implementing inclusive education and their inclusive practices in Finland. An additional aim is to examine whether intentions are influenced by teachers' attitudes toward inclusion, their inclusive teaching efficacy, and subjective norms in implementing inclusive education based on the "Theory of Planned Behaviour (TPB)". In autumn 2022, data was collected with an electronic survey from 7 municipalities in the Keski-Uusimaa region in Finland from 88 schools that are part of the "Kaikille yhteinen koulu (School for All)" project. The participants of the survey were teachers working in those schools. The following scales, which were translated into Finnish, were used: Attitudes towards Inclusion Scale (AIS), Teacher Efficacy for Inclusive Practice (TEIP) Scale, Subjective Norm Scale, Intention to Teach in Inclusive Classroom Scale (ITICS) and Inclusive Practices Scale (IPS). The Mplus software programme will be used to carry out Structural Equation Modelling (SEM). The results of the study will further our understanding of the dynamics between teacher attitudes, efficacy beliefs, subjective norms, intentions, and practices in the context of inclusive education. The results will also have significant implications for the development for the teachers' professional development in inclusive education.

Prerequisites for primary school teachers' practices in the inclusive classroom
Presenting Author: Marwin Felix Loeper, Paderborn University, Germany; **Co-Author:**Gamze Görel, Paderborn University, Germany; **Co-Author:**Frank Hellmich, Paderborn University, Germany

Within the rationale of the Theory of Planned Behaviour (Ajzen, 1991), we investigated in our study whether the inclusive practices of N = 290 primary school teachers in heterogenous learning groups can be explained by their behavioural intentions to implement inclusive education and their self-efficacy beliefs. Furthermore, we examined if teachers' attitudes towards inclusion, their perceptions of their principals' expectations concerning the implementation of inclusive education in the classroom, and their self-efficacy beliefs are predictive for their behavioural intentions. Unfortunately, the current state of research turns out to

be inconsistent in this regard (e.g., Malak, Sharma, & Deppeler, 2018; Yan & Sin, 2014). Thus, further investigations are highly recommended to determine the prerequisites for teachers' successful inclusive practices in heterogenous learning groups. The results of our structural equation analysis revealed a significant relationship between teachers' inclusive practices and their behavioural intentions for one thing. Then again, we found out that teachers' attitudes towards inclusion, their perceived principals' expectations and their self-efficacy beliefs explain their behavioural intentions.Overall, our findings highlight the importance of teachers' attitudes towards inclusion, their perceived principals' expectations, and their self-efficacy beliefs for their behavioural intentions and their inclusive practices in the classroom. In conclusion, our results contribute to clarify the Theory of Planned Behaviour in the context of inclusive education.

Session B 4

22 August 2023 15:00 - 16:30
UOM_CR
Symposium
Learning and Instructional Technology

Designing effective digital learning environments – reviewing the evidence

Keywords: Achievement, Computer-assisted Learning, E-learning/ Online Learning, Educational Technologies, Immersive Technologies for Learning, Instructional Design, Meta-analysis, Multimedia Learning, Science Education, Teaching/Instructional Strategies, Video-based Learning
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Ingo Kollar, University of Augsburg, Germany
Organiser: Andreas Gegenfurtner, University of Augsburg, Germany
Organiser: Ingo Kollar, University of Augsburg, Germany
Discussant: James Slotta, OISE, University of Toronto, Canada

Practitioners put high hopes in digital learning environments to support student learning at different educational levels. However, it is not easy to keep track of the empirical evidence on the effects of different digital learning environments on cognitive, motivational, and affective learning outcomes. This symposium provides a sneak peak into a recent volume from the EARLI book series that includes 20 chapters that summarize the (predominately meta-analytical) evidence of different technological tools and approaches on learning in different educational settings. After an overview of the volume by its editors, the four papers of the symposium present single chapters in more detail: Paper 1 talks about the effects of web-based inquiry science environments to advance student learning. As the authors show, their effects seem to strongly depend on the provision of automated, adaptive guidance for learners. Paper 2 focuses on the effects of instructional videos on learning. Thereby, the authors provide six evidence-based tips for their effective design. Paper 3 presents empirical evidence on the effects of immersive virtual environments for learning. There, available evidence points to the importance of immersion, interaction, and embodiment to foster learning. Paper 4, finally, summarizes empirical research on the effects of flipped classrooms on cognitive learning outcomes. Based on the rather small effect sizes from related meta-analyses, the authors identify several deficits in the realization of flipped classrooms that need to be overcome to possibly arrive at larger effects. The symposium will be concluded with a discussion by a renowned expert on technology-enhanced learning.

Assessing Web-based Inquiry Learning Environments Using Knowledge Integration Pedagogy
Presenting Author: Sarah Bichler, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Marcia Linn, University of California-Berkeley, United States; **Co-Author:**Libby Gerard, University of Berkeley, United States

We report on the impact of Authoring and Customizing Environments (ACEs) using the lens of Knowledge Integration Pedagogy on classroom science inquiry learning. Recently, web-based ACEs have emerged that empower partnerships of classroom teachers, discipline experts, software designers, and researchers to create and customize inquiry instruction. The KI pedagogy and other constructivist views have informed designs of ACEs. The KI pedagogy draws on four processes to promote integrated science understanding through ACEs designs: (1) Eliciting learners' current ideas, including encouraging learners to generate the reasoning behind their ideas; (2) Discovering new ideas, for example, from scientific models, publicly available data, or peers; (3) Distinguishing among current ideas and new discoveries; and (4) Reflecting on this repertoire of ideas, connecting and sorting them into a coherent view. Many blended and online learning science platforms such as edCrumble, Go-Lab Software, Inq-IT, nQuire-it, and WISE have features of ACEs including authoring opportunities, support for collaboration, visualizations, and hands-on science. The effectiveness of these environments depends on personalized guidance from both the online platform and the classroom teachers. Meta-analyses of the impact of inquiry environments that include ACEs and reviews of inquiry instruction document the impact of inquiry instruction for pre-college science learning. Recently ACEs have added tools that connect teacher and automated guidance to optimize student learning outcomes. In this presentation we summarize the evidence for the impact of digital inquiry environments including ACEs, describe an example of a unit leveraging cutting-edge ACE features to support teachers guiding inquiry, and recommend next steps.

Six evidence-informed tips on how to optimize learning from instructional videos
Presenting Author: Vincent Hoogerheide, Utrecht University, Netherlands; **Co-Author:**Stoo Sepp, University of New England, Australia, Australia

Learning from instructional video is incredibly popular for people of all ages and at all educational levels. The effects of studying instructional videos on learning outcomes have traditionally been examined by two main research traditions. Research inspired by social-cognitive theories has focused mostly on the effects of video modelling examples, which are how-to demonstration videos in which a person shows and explains how to complete a task or solve a problem. Research inspired by cognitive theories predominantly examined the effects of other types of videos, such as short knowledge clips explaining a concept or longer recordings of lectures. In this narrative review, we synthesize the findings from both research lines and provide six evidence-informed tips that can help educators and educational content developers decide how to design their instructional videos and how to support instructional video learning. Based on the available evidence, we suggest to (1) avoid seductive details and redundancy, (2) provide cues to direct attention, (3) segment and pause (longer) videos, (4) show the presenter of the video on the screen, (5) show a demonstration from a first-person perspective, and (6) encourage learners to engage in generative learning activities, such as answering practice questions, summarizing, and generating explanations. This review thereby offers clear recommendations for educational practice and provides possibilities for cross pollination between the two main research traditions in terms of for instance research questions, theoretical underpinnings, and outcome measures.

Designing Effective Immersive Virtual Learning Environments
Presenting Author: Guido Makransky, University of Copenhagen, Denmark; **Co-Author:**Gustav Petersen, University of Copenhagen, Denmark

In this paper, we summarize the current body of research evidence related to learning with immersive virtual reality (VR). We build on recent reviews and meta-analyses to provide an overview of the most important findings in the field. This is followed by a summary of recent theories including the Cognitive Affective Model of Immersive Learning, the Immersion Principle in Multimedia Learning, and the Cognitive-Affective-Social Theory of Learning in digital Environments, which describe the important factors that play a role in learning in immersive environments. The theories and research evidence are then used to develop an iVLE design framework, which is a theory- and research-based model that can be used to guide the development of immersive learning content. This is followed by a future research agenda in light of recent developments such as the increased focus on immersive learning due to the COVID pandemic and the potential impact of the Metaverse.

Effectiveness of Flipped Classrooms
Presenting Author: Marlene Wagner, University for Continuing Education Krems (Danube University Krems), Austria; **Co-Author:**Andreas Gegenfurtner, University of Augsburg, Germany; **Co-Author:**Detlef Urhahne, University of Passau, Germany

Over the past decade, flipped classroom instruction has attracted increasing attention and popularity among educational practitioners and researchers. Flipped classroom, also known as inverted classroom, refers to an instructional approach in which students study educational materials at home and complete homework assignments in class. Myriad empirical studies have been conducted in the past years to examine the effectiveness of flipped classroom in various educational settings and across different disciplinary fields. The extensive body of research has already been synthesized in several meta-analyses as well as

second-order meta-analyses. The aim of this paper is (1) to elaborate the theoretical underpinnings of flipped classroom, (2) to provide an overview of meta-analytic evidence for the effectiveness of flipped classroom instruction in school and higher education, and (3) to propose reasonable explanations for the low to medium effect sizes that were found in previous meta-analyses. Particular focus is placed on instructional design characteristics of flipped classroom instruction, which have an impact on the effectiveness. Such design characteristics include the use of formative assessments (e.g., quizzes), pre-class activities (e.g., pre-class discussions), in-class learning activities (e.g., group-based activities), and learning management systems (e.g., Moodle). The paper concludes with a set of guidelines for a successful implementation of flipped classroom in different educational settings.

Session B 5

22 August 2023 15:00 - 16:30
UOM_A02
Symposium
Motivational, Social and Affective Processes

New insights on the relation between children's mathematics attitudes and their performance

Keywords: Achievement, Anxiety and Stress, Attitudes and Beliefs, Developmental Processes, Mathematics/Numeracy, Parents' Beliefs and Affect, Primary Education
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Jo Van Hoof, University of Turku, Finland
Organiser: Jo Van Hoof, University of Turku, Finland
Organiser: Hilma Halme, University of Turku, Department of Teacher Education, Finland
Discussant: Reinhard Pekrun, University of Essex, United Kingdom

Ample studies showed that mathematics attitudes are related to mathematics performance; however there are still many open questions in the literature. The objective of this symposium is to extend the research field on the role of mathematics attitudes, especially mathematics anxiety, in children's mathematics achievement in two ways.
First, the directionality of the relation between mathematics attitudes and performance is still under debate. To address this important issue, the first study of the symposium investigates the bi-directional longitudinal relationship between general mathematics attitudes and mathematics achievement using a representative dataset including approximately 600.000 elementary school learners. The second study complements this by zooming into one specific mathematics attitude, namely mathematics anxiety, to examine its developmental associations with mathematics performance in a large group of elementary school students.
Second, the symposium extends the above mentioned and previous research by investigating specific factors that might influence the relation between mathematics anxiety and mathematics performance. More specifically, the third study adds insights into intergenerational relations to discuss the extent to which mathematical abilities of children are associated with the mathematical anxiety of their parents. Lastly, the fourth study emphasizes that the previous research should be expanded to consider differences across various mathematical tasks and mathematics anxiety measures.
Taken together, this symposium will give a glance at (1) how learners' mathematics attitudes and performance (co)develop and (2) which factors should be considered while investigating these relations. During the symposium, particular attention will be given to both theoretical and educational implications of the different studies.

Doing Well and Thinking Positively: The Unbalanced Relation Between Math Attitudes and Achievement
Presenting Author: Michael Slipenkyj, Georgetown University, United States; **Co-Author:**Tsz Tan Lau, The University of Western Ontario, Canada; **Co-Author:**Ian Lyons, Georgetown University, United States; **Co-Author:**Daniel Ansari, University of Western Ontario, Canada

Past work shows that children with more positive math attitudes tend to have a higher level of math achievement (e.g., Dowker et al., 2019). However, it is unclear how this relationship manifests across development and in a large-scale educational setting. Specifically, do earlier math attitudes predict later math achievement? Does earlier math achievement predict later math attitudes? Or both? In the present study, we investigate the bi-directional longitudinal relationship between math attitudes and math achievement using four cohorts from a large (total N = approximately 600,000) Canadian province-wide dataset. Students completed math tests and answered attitude questionnaires in grades 3, 6, and 9. To assess the developmental trajectory of attitudes and achievement, we used a traditional cross-lagged panel model (CLPM), as well as a random intercept cross-lagged panel model (RI-CLPM) to account for between-subject variability (Hamaker et al., 2015; Bailey et al., 2020). Results demonstrate improved model fit for the RI-CLPM, with both models showing positive autoregressive and bi-directional paths. Notably, the cross-lagged paths were stronger for achievementà attitudes compared to the other way around. Broadly, our findings demonstrate that in an educational context, the developmental relationship between math attitudes and math achievement is bi-directional, but with stronger effects from earlier achievement to later attitudes. This study was preregistered on the Open Science Framework.

Developmental relations between mathematics anxiety, number processing and arithmetic fluency
Presenting Author: Johan Korhonen, Åbo Akademi University, Finland; **Co-Author:**Anna Widlund, Åbo Akademi University, Finland

Although the negative link between math anxiety and performance is well documented, there is a lack of longitudinal studies investigating elementary school students. Therefore, we investigate developmental relations between math anxiety (MA), number processing (NP) and arithmetic fluency (AF) within a school year in grades 4, 5 and 6 (N=1000). Students´ complete digital measures of MA, NP and AF in the beginning and end of the school year. Confirmatory factor analyses in T1 showed that MA was negatively related to AF but not to NP. AF and NP were clearly separable constructs and were differentially related to MA. Multigroup latent change score modelling will be used to investigate how change in MA is related to changes in NP and AF across grades 4, 5 and 6. This study will advance our knowledge on developmental dynamics between MA, NP, and AF in elementary school students across three grade levels.

The association between parents' math anxiety and children's math anxiety and achievement
Presenting Author: Elien Bellon, KU Leuven, Belgium; **Co-Author:**Kiran Vanbinst, KU Leuven, Belgium; **Co-Author:**Bert De Smedt, KU Leuven, Belgium; **Co-Author:**Ann Dowker, University of Oxford, United Kingdom

Although there is evidence for negative moderate association between math anxiety and mathematics achievement and subsequent educational outcomes, the origins of math anxiety remain unclear. Few studies have explored the role of intergenerational factors in this association. We therefore investigated the extent to which math anxiety of parents is associated with their offspring's mathematical achievement and math anxiety, while also considering parental educational level and parents' mathematical achievement. We examined this before the start of formal schooling (i.e., 83 preschoolers; 5–6-year-olds), and before the start of secondary school (i.e., 172 primary school children; 11-12-year-olds). In both studies, both biological parents completed a mathematical anxiety questionnaire, and their educational level and mathematical achievement were measured. Children performed age-appropriate tasks to investigate their mathematical achievement. Primary school children also completed a math anxiety questionnaire. The results in preschoolers indicated that parents' math anxiety was strongly correlated with their own math achievement but not to that of their children. In primary school, only maternal math anxiety was associated with that of their child. Math anxiety of primary school children was associated with parental educational level. These findings suggest a complex familial basis for math anxiety and mathematics achievement in primary school. These data help us understand individual differences in between academic achievement and affect in children. They might suggest novel ways to detect children at risk for developing negative affect or mathematical difficulties at early stages and might lead to the development of early preventive educational interventions that also involve parents.

Trait and state mathematics anxiety relate to performance across tasks in primary school
Presenting Author: Hilma Halme, University of Turku, Department of Teacher Education, Finland; **Co-Author:**Kelly Trezise, University of Chicago, United States; **Co-Author:**Minna Hannula-Sormunen, University of Turku, Finland; **Co-Author:**Jo Van Hoof, University of Turku, Finland; **Co-Author:**Jake McMullen, University of Turku, Finland

Mathematics anxiety negatively relates to students' mathematical achievement already in primary school, but there is little research on its effects beyond whole

number knowledge. The current study aims to examine how state and trait mathematics anxiety relate to performance across five tasks that are relevant for mathematics development in primary school. These tasks include non-symbolic quantities, whole numbers, and rational numbers. The participants were 406 students attending the 5th grade and 6th grade (i.e., 11-12 years old). Our results showed that students' self-evaluated state and trait mathematics anxiety had varying negative relations with performance depending on the task type. Overall, our results indicate that existing accounts on the role of mathematics anxiety in mathematics performance should expand to consider differences across task type and measures of anxiety.

Session B 6

22 August 2023 15:00 - 16:30
AUTH_T102
Symposium
Teaching and Teacher Education

Knowledge about Language and the Teaching of L1 Writing: International Perspectives

Keywords: Cognitive Skills and Processes, Communication Skills, Dialogic Pedagogy, L1/Standard Language Acquisition, Qualitative Methods, Reasoning, Teaching Approaches, Writing/Literacy
Interest group: SIG 12 - Writing, SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Debra Myhill, University of Exeter, United Kingdom
Organiser: Annabel Watson, University of Exeter, United Kingdom
Discussant: Xavier Fontich, Autonomous University of Barcelona, Spain

The role of linguistic and metalinguistic knowledge in supporting L1 writing development is a burgeoning research area. This symposium examines this in the context of how writing is taught in school, starting with a study of the earliest years of school education in Norway (age 6-7), moving through the final year of Primary education in England (age 10-11), to the first years of English Secondary schooling (age 11-14), and then considering student teacher metalinguistic knowledge in the Netherlands. Together, the papers present the opportunity to reflect on important emerging knowledge concerning (a) how young writers exhibit linguistic and metalinguistic knowledge through talk and writing, (b) the relationship between declarative knowledge revealed in talk and procedural application in writing, (c) the role that pedagogic dialogue plays in bridging this gap, and (d) the challenges experienced by teachers in developing confident understanding of metalinguistic concepts. The symposium develops theoretical understanding of the interaction between knowledge about language and writing development across the school years. Looking across papers will allow us to probe assumptions relating to how the explicit teaching of linguistic repertoire might influence writing, particularly concerning the sophistication of the personal repertoire of early writers, problems of transfer from declarative to procedural knowledge, and the complex demands it places on teachers. Crucially, the symposium responds to the theme of 'Education as Hope' by focusing on the opportunities as well as challenges presented by writing pedagogies which seek to develop young writers' ability to express ideas with confidence, deliberation, and metacognitive awareness.

Young pupils' knowledge about language expressed through writing and in dialogues
Presenting Author: Mari Nygård, NTNU, Norway; **Presenting Author:**Randi Solheim, Faculty of Social and Educational Sciences, Norway

This study draws on a large-scale mixed methods RCT-study, *Functional writing in primary school*. Quantitative analyses show no effect on pupils writing development, which points to the need for closer qualitative analyses aiming towards a more nuanced understanding of pupils' competence. We thus ask: *How is young writers' grammatical competence made visible through writing? And how are pupils' individual knowledge and experiences of language expressed in writing and text dialogues in various learning contexts?* Our analyses draw on different types of empirical data: pupils' texts, classroom observations and language dialogues.Our analyses are two-fold, one part providing an overview of a larger text sample, and one part providing closer insight into individual competences. The overall aim is to obtain a more fine-grained picture of pupils' linguistic meta-competence. The analyses show that grammatical competence is comprised of several sub-competencies: *repertoire*, *complexity*, *variation,* and *choice*. Contrary to traditional views, we do not model linguistic progression as linear, from repertoire to writers' choices. Rather, awareness about purposes of writing may help pupils to see themselves as *writers*, even for those who do not master linguistic conventions. We relate our findings to different levels of linguistic and meta-linguistic competence. Our study may contribute methodological, theoretical, and didactic insights to the field of early writing. Through analyses of various types of empirical data, understood through different theoretical lenses, we argue for the need for teachers to recognize different aspects of linguistic meaning making and to make these visible for the pupils.

What transfers and how? Examining how contextualised grammar teaching influences students' writing.
Presenting Author: Annabel Watson, University of Exeter, United Kingdom

This paper presents qualitative data gathered during a large-scale randomised control trial funded by the Education Endowment Foundation in England. This investigated the impact of contextualised grammar teaching on the writing development of children aged 10-11. It found no statistically significant impact, and this paper explores one potential reason why, examining what did and did not transfer from the explicit grammar teaching of the intervention into children's writing. Lesson observations and writing samples were collected from two classes undergoing an intervention cycle which focused on teaching persuasive writing with embedded attention to grammatical forms, using mentor texts, dialogic talk and writing tasks to develop metapragmatic and stylistic reflection on language. Classroom discourse was coded thematically, building on a theoretical model of Metatalk to explore how declarative knowledge was constructed through dialogue, and how shared writing and oral rehearsal supported transfer to procedural application. Linguistic coding of writing samples identified where and how children used the taught grammatical features in their writing. Comparison across datasets identified how the understandings, partial understandings and misunderstandings captured in the lesson observations manifested in children's writing. Findings contribute to the development of linguistically-orientated pedagogies for writing which attend to the need to support transfer between procedural and declarative knowledge, particularly contributing (1) evidence of reciprocity between declarative and procedural knowledge; (2) evidence that word and text level features are easier to transfer; (3) tentative evidence of the interference of previous learning, and the potential for ingrained patterns to inhibit application of new, more sophisticated, structures.

Metalinguistic modelling in writing instruction: bridging learning about text and individual writing
Presenting Author: Ruth Newman, University of Exeter, United Kingdom

Working with 7 teachers and their Key Stage 3 classes (students aged 11-14) in the South West of England, this ESRC funded study continues to investigate and develop an evidence-based pedagogy for the development of metalinguistic talk about writing. Pedagogical strategies, co-constructed iteratively with teachers, emphasise the role of authentic texts in writing instruction – for stimulating metalinguistic discussion and as models for students' own writing. The generation of a multi-layered, inter-related dataset of observational and textual data drawn from sample classes (75 lessons) has enabled an investigation of how this metalinguistic talk about text models informs and shapes students' writing choices. This paper highlights the complexity of this learning transfer – from talk about text to writing – and explores the potential of a particular pedagogical strategy, metalinguistic modelling, as a 'bridging' mechanism in this process. This paper, and the findings arising from the wider project, contribute to theoretical understandings of metalinguistic talk and learning transfer in writing instruction, whilst contributing pedagogical strategies that may support teachers and students in implementing metalinguistic talk.

L1 student teachers' processing of different linguistic arguments in grammatical discussions
Presenting Author: Jimmy van Rijt, Tilburg University, Netherlands

An important skill for L1 language teachers when teaching grammar is the ability to produce and quickly evaluate arguments that underpin a grammatical analysis. Previous research has revealed that the strongest arguments in favor of a particular grammatical analysis are based on linguistic manipulations (LM) rather than on rules of thumb (RoT). This makes it critical for teachers to be able to handle arguments based on LM. If LM are considered too difficult to process compared to RoT, however, teachers may avoid linguistic argumentation based on LM altogether, and they might struggle to evaluate students' LM-based linguistic argumentation. The current study has therefore examined whether LM impose a higher cognitive load on Dutch student teachers than RoT, using grammatical discussion tasks in which participants (N=298) from eight teacher training institutions evaluated arguments based on RoT and on LM. Multilevel

analyses indicate that LM are indeed more difficult to process than RoT, as measured by response times, correct classifications and perceived difficulty ratings. This effect is partly influenced by students' need for cognition and their willingness to engage in grammar. The implications of this for educational practice will be discussed.

Session B 7

22 August 2023 15:00 - 16:30
UOM_A13
Symposium
Instructional Design

Powerful learning environments for 4-7-year-olds: Interactive picture book reading

Keywords: Communication Skills, Early Childhood Education, Instructional Design, Mathematics/Numeracy, Quantitative Methods, Teaching/Instructional Strategies
Interest group: SIG 05 - Learning and Development in Early Childhood
Chairperson: Joke Torbeyns, KU LEUVEN, Belgium
Organiser: Joke Torbeyns, KU LEUVEN, Belgium
Organiser: Hilde Van Keer, Ghent University, Belgium
Discussant: Maria T. Sikkema-de Jong, Leiden University, Netherlands

Decades of research in the domain of early literacy and language convincingly demonstrated the potential of interactive picture book reading (IPBR) for young children's development in these domains (Hindman et al., 2019; Mol & Bus, 2011). In IPBR, interaction with children is purposefully provided during reading by discussing meanings of words, asking open-ended questions, and elaborating on children's responses (August et al., 2018). Based on prior findings, researchers started to analyze mechanisms that might explain IPBR's effectiveness and explore its potential for competencies acquisition in other domains. Deepened understanding of these underlying mechanisms in the domain of early literacy and language and beyond can help to improve current educational IPBR practices. This symposium brings together four empirical studies on IPBR effectiveness for 4-7-year-olds' language and STEM development. In the first contribution an intervention on the effectiveness of IPBR for enhancing preschoolers' problem-solving skills is presented. The second contribution focuses on mathematics, and also analyzes the mechanisms underlying IPBR effectiveness in this domain. The authors of the third and fourth contribution investigate the characteristics of the words in the picture book explicitly focused on during IPBR respectively the reading style as variables contributing to IPBR effectiveness in the domain of language acquisition. Together, these contributions deepen current insights into IPBR as powerful learning environments for 4-7-year-olds. These insights are important for current educational practice, teacher training and professional development initiatives, as will be discussed by Marga Sikkema-de Jong, expert on IPBR and emergent literacy in young children.

Enhancing problem-solving skills in preschool through interactive picture book reading
Presenting Author: Joris Van Elsen, University of Antwerp, Belgium; **Co-Author:**Leen Catrysse, Open Universiteit, Department of Online Learning and Instruction, Belgium; **Co-Author:**Sven De Maeyer, Antwerp University, Belgium

Problem solving is an important 21st century skill and plays a key role in learning and living in an ever-changing society. Preschool age is considered the ideal time to enhance problem-solving skills. However, teaching problem-solving skills in the preschool classroom is not easy. This paper examines the effectiveness of interactive picture book reading (IPBR) for the development of problem-solving skills in preschoolers. A total of 130 4-to-6-year-olds participated in a pretest-posttest quasi-experiment with non-equivalent control group. Problem-solving skills were measured with two pictorial multiple solutions tasks. Multilevel analysis indicates that IPBR can improve preschoolers' flexibility, fluency and originality in coming up with possible solutions to a visually presented problem. In addition, we found that preschoolers' emotional reactions to the test situation influenced test scores. The findings demonstrate that preschoolers are able to suggest different solutions to a problem and that IPBR is an effective way to stimulate creative problem solving. Further research is needed into the effectiveness of interaction processes and possible approaches to assess problem-solving skills in preschoolers in a valid and reliable way.

The Effects of a Quantitative Mathematical Language Intervention on Number Line Skills and SFON
Presenting Author: David Purpura, Purdue University, United States; **Co-Author:**Connor D. O'Rear, Purdue University, United States; **Co-Author:**Alexa Ellis, Purdue University, United States; **Co-Author:**Lauren Westerberg, Purdue University, United States; **Co-Author:**Mackenna Vander Tuin, The University of Texas, United States; **Co-Author:**Patrick Ehrman, Purdue University, United States; **Co-Author:**Yemimah A. King, Spelman College, United States

The focus of the current intervention was on examining the effects of a quantitative language intervention on children's number line and spontaneous focus on number (SFON) skills. These effects were examined because number line and SFON are two potential mechanisms that explain why quantitative language interventions have been shown to also impact numeracy skills. As part of a larger intervention study, children were randomly assigned to conditions including a quantitative language intervention and an active control group. Interventions were conducted in small groups using researcher-designed picture books. The picture books for the quantitative language condition had quantitative language (e.g., words such as *many, most, same, different, few, fewest*) in the text and in interactive reading prompts embedded on each page. The picture books for the active control condition were designed similarly and did not contain quantitative language terms. Reading sessions occurred for three sessions per week over eight weeks (total possible sessions = 24). Regression analyses indicated no statistically significant effects on either SFON or number line skills, but the effect size for number line skills was meaningfully important (d=-0.36). These findings suggest that a quantitative language intervention may have impacts on number line skills. Future research should investigate this as a potential mechanism explaining the impact of quantitative language interventions on numeracy development.

What's in a word: impact of interactive book reading on 1st-graders' expressive target vocabulary
Presenting Author: Silke Vanparys, Ghent University, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium

Interactive book reading (IBR) as a context for vocabulary learning is studied widely in kindergartners. In the present study, we build on and aim to elaborate the prior knowledge base in this respect for that age group by studying the effects of a five-week IBR intervention on first graders' expressive target vocabulary growth. A repeated measures design with two experimental conditions (researcher-imposed target words vs. teacher-selected target words) was set up. 240 children (age M=5.8, SD=0.55) and their 15 first-grade teachers from 7 schools in Flanders (Belgium) participated in this study. Repeated measures ANOVA confirmed the expected positive effects of IBR on first graders' expressive target vocabulary, measured via the TEVOC test. In follow-up analyses, characteristics of the targeted words were considered to study potentially differential intervention effects. More particularly, the age of acquisition (AoA) and tier of vocabulary of each target word was taken into account. No differences were found as to the impact of IBR on the learning of low, medium, and high AoA words and the effects of the intervention were comparable for tier 2 and tier 3 words. These findings indicate that IBR is an excellent context to teach challenging and domain-specific vocabulary.

The effect of interactive picture book reading on language competence in early childhood education
Presenting Author: Chiel van der Veen, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Sharisse van Driel, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Femke van der Wilt, VU Amsterdam, Netherlands

Although research has shown that interactive picture book reading can promote young children's language skills, many teachers use a passive reading style as they find it challenging to support effective interaction. The aim of the present study is to investigate the effect of an intervention based on dialogic teaching during interactive picture book reading on young children's language competence. A total of 403 children aged 4-7 from 21 classrooms participated in the current randomized experimental study. All teachers read, during six subsequent weeks, each week a picture book repeatedly to the entire classroom and made video recordings of all sessions. Teachers in the intervention condition received the Model2Talk intervention consisting of a workshop on dialogic classroom talk and the use of dialogic talk tools, a teacher manual and coaching sessions. Before and after the book reading intervention children were individually assessed on their communicative functions, vocabulary and narrative skills. Multilevel models were used to examine differences between the control and intervention

condition regarding children's language competence. No significant differences appeared between the intervention and control condition. However, findings show that the language competence significantly improved for all children suggesting that different strategies for interactive picture book reading result in improved language competence. Findings reveal that teachers can use different strategies for supporting children's language competence during interactive picture book reading.

Session B 8

22 August 2023 15:00 - 16:30
AUTH_TE2
Symposium
Higher Education, Lifelong Learning, Teaching and Teacher Education

Studying Professional Learning Communities of pre-service teachers, principals & university faculty

Keywords: Cooperative/Collaborative Learning, Higher Education, Mixed-method Research, Peer Interaction, Pre-service Teachers, School Effectiveness, School Leadership, Sustainable Development, Teacher Professional Development
Interest group: SIG 14 - Learning and Professional Development
Chairperson: Peter Theurl, Austria
Organiser: Loucas Louca, European University Cyprus, Cyprus
Discussant: SOFIA AVGITIDOU, Aristotle University of Thessaloniki, Greece

For a number of years, Professional Learning Communities (PLCs) have led to a paradigm shift in teachers' professional development approaches across Europe and beyond. PLCs are viewed as an alternative form of professional learning providing teachers a framework in which they act as learners and schools as learning communities. The proposed symposium seeks to comparatively investigate and discuss PLCs in 4 different contexts, in 5 different countries, from 3 different research programs, focusing on similarities and differences of PLCs in different levels and contexts. Contexts include investigation of PLCs at the (1) pre-service teacher level by investigating the affordances of PLCs as early as pre-service teachers' practical pedagogical studies (internship) in Austria and Spain; (2) school principal level by investigating how the PLC structure and the use of actions plan affect professional development in a principals' PLC, and also how it affects their schools in Sweden; (3) school leaders level by examining the motivation of the school leaders to participate in their own PLC, milestones of the establishment and conditional and constituent factors of the school leaders PLCs in Germany; (4) university faculty level by examining PLCs as the structure for evidence-based teaching reform within the university faculty teaching practice and factors related to the willingness to engage in PLCs and sources of information which participants highlighted as important in shaping their teaching reform at a small university in Cyprus.

An Investigation of the Introduction Faculty Professional Learning Communities in Higher Education
Presenting Author: Loucas Louca, European University Cyprus, Cyprus; **Co-Author:**Theopisti Skoulia, European University - Cyprus, Cyprus; **Co-Author:**Marios Vryonides, European University - Cyprus, Cyprus

Moving from an approach of educating faculty about new teaching and learning approaches, to supporting them in their attempts to utilize paradigmatic changes in their teaching, this study explores the potential introduction of faculty Professional Learning Communities (PLCs) as an innovative way to enhance instructors' teaching competencies in higher education. Specifically, the study seeks to identify faculty PLCs structures that could encourage evidence-based teaching reform within the faculty members' teaching practice. Data were collected from 127 faculty using an online questionnaire in June 2022. Analysis showed factors related to the willingness to engage in PLCs and sources of information which participants highlighted as important in shaping their teaching reform. The study's implications point towards new directions of supporting faculty in their effort to enhance their teaching competencies to enrich university students' learning experiences and opportunities. The policy implications of this investigation point to a novel way of supporting faculty in their effort to enhance their teaching competencies in the context to improve university students' learning experiences and opportunities.

Professional learning communities extended as a method for leadership development
Presenting Author: Katja Kansteiner, Pädagogische Hochschule Weingarten, Germany

During the past ten years first explorations to adapt PLCs to school leaders (school heads) have been successfully run in some US-American school districts. In a European project School Leaders-PLCs (SL-PLCs) were also set up, facilitated, and evaluated. In Germany, additional data were collected to inquire about the motivation of the school leaders to participate in a SL-PLC, milestones of the establishment, and conditional and constituent factors of the SL-PLCs. By Grounded Theory Methodology we developed a model for the establishment of SL-PLCs. It is the interaction of continuous investment of the PLC members and the assurance of constant benefit that secures the establishment as much as the raising liability in the cooperation and a jointly growing understanding of how PLCs work. We found it is mainly the positive attitude to innovation and the interest to forward school development that motivates the school leaders the engagement in the SL-PLC. We will present the model and point out how this adaptation of PLCs to leadership development has the potential to serve innovation in schools.

Professional Learning Communities of Pre-Service Teachers in Internship
Presenting Author: Peter Theurl, University of Teacher Education Vorarlberg, Austria; **Co-Author:**Eva Frick, University of Education Vorarlberg, Austria; **Co-Author:**Elvira Barrios, Universidad de Málaga, Spain; **Co-Author:**Carmen Sanchidrián, Universidad de Malaga, Spain

Since the early 1990s, Professional Learning Communities (PLCs) have been a proven, widespread, and well-researched means of school- and instructional development, as well as the development of school leaders. The present study is one of the first to systematically examine the possibilities and potential of PLCs for pre-service teachers in their practical pedagogical studies (internship) in Austria and Spain. In particular, the study examines whether and how Student-Teacher-PLCs (S-PLCs) can be implemented in pre-service education, how the acceptance of S-PLCs is among pre-service teachers, whether there is evidence of the development of professional knowledge and skills associated with teaching, particularly reflexivity as a crucial competence, and whether the pre-service teachers were able to acquire PLC-relevant competencies. A total of 59 students from the University of Teacher Training Vorarlberg and the University of Málaga were surveyed using an online questionnaire and focus group interviews. The data collected show that S-PLCs is a profound form of (cooperative) learning and development of professional and PLC-relevant competencies for students. Analysis of the qualitative data furthermore shows that S-PLCs are spaces where the reflection and analysis of teaching-related topics are stimulated, supported, shared, and encouraged.

The importance of structure and action plans in a professional learning community for principals
Presenting Author: Anne Berit Emstad, Norwegian University of Science and Technology (NTNU), Norway; **Co-Author:**Bård Knutsen, NTNU - Norwegian University of Science and Technology, Norway; **Co-Author:**Morten Krogstad Strand, Kattem skole, Trondheim, Norway

Fahey (2011) argues that principals can learn to build learning-focused, reflective professional communities by developing and participating in their own Professional Learning Community (PPLC). By participating, they are experiencing how to be a part of a reflective culture, assess their own leadership practices, de-private their own practice and how to both give and receive feedback and reflect on their own principal role. Since 2014, a municipality in Sweden has had a requirement that all principals must participate in a professional learning community. Since their inception, they have preferred to build on Williams' (2008) model for teachers who work in learning communities to develop their assessment skills through the use of action plans about what he or she wants to change, and a fixed structure at all meetings. In the paper we present a study in which we have investigated how structure and use of actions plan affect professional development in this PPLC in Sweden, and also how it affects their schools. Our interest lies in being able to contribute to increased knowledge in the importance of principal professional learning community.

Session B 9

22 August 2023 15:00 - 16:30

AUTH_DC2
Symposium
Assessment and Evaluation

Effects of the COVID-19 pandemic on student achievement

Keywords: Achievement, Competencies, Mathematics/Numeracy, Meta-analysis, Pandemic, Primary Education, Reading, School Effectiveness, Secondary Education
Interest group: SIG 18 - Educational Effectiveness and Improvement
Chairperson: Natalie Foerster, University of Münster, Germany
Organiser: Natalie Foerster, University of Münster, Germany
Discussant: Andreas Frey, Goethe-Universität Frankfurt, Germany

In spring 2020, the world experienced a global pandemic triggered by the coronavirus. When governments announced the shutdown of schools to limit the spread of the coronavirus, more than 1.5 billion students in over 190 countries had to stay at home. This led to immediate concern about long-term educational consequences. Today, there are several studies showing that concerns may be justified, pointing to a decline in student achievement and a widening of learning gaps because of pandemic-related school closures. In this symposium, we add to the existing literature on the impact of the COVID-19 pandemic on education with new evidence from German-speaking countries and a new meta-analysis on student learning loss over the course of the pandemic. The first paper presents results on second-grade students' reading growth in Germany during the first and second years of the pandemic compared to students' growth in the four school years prior to the pandemic. In the second presentation, growth rates of Austrian third graders in mathematics in the first half-year with distance learning periods are compared to growth rates in the second half-year without distance learning. Results from Swiss students are presented in the third contribution. Using data from 2019 to 2021, student performance in core subjects of mathematics, German, English, and French is compared before and during the pandemic. The final presentation will present a new AI-supported meta-analysis of average student learning loss over the course of the pandemic, including moderator analyses of pandemic phase, subject, and grade.

Effects of the COVID-19 Pandemic on Reading Performance of Second Grade Children in Germany
Presenting Author: Natalie Foerster, University of Münster, Germany; **Co-Author:**Boris Forthmann, University of Münster, Germany; **Co-Author:**Mitja D. Back, University of Münster, Germany; **Co-Author:**Elmar Souvignier, University of Muenster, Germany

In education, among the most anticipated consequences of the COVID-19 pandemic are that student performance will stagnate or decline and that existing inequities will increase. Although some studies suggest a decline in student performance and widening learning gaps, the picture is less clear than expected. In this study, we add to the existing literature on the effects of the COVID-19 pandemic on student achievement. Specifically, we provide an analysis of the short- and mid-term effects of the pandemic on second grade reading performance in Germany using longitudinal assessments from over 19,500 students with eight measurement points in each school year. Interestingly, the effects of the pandemic established over time. Students in the first pandemic cohort even outperformed students from the pre-pandemic cohorts and showed a tendency towards decreased variances during the first lockdown. The second pandemic cohort showed no systematic mean differences, but generally had larger interindividual differences as compared to the pre-pandemic cohorts. While the gender achievement gap seemed unaffected by the pandemic, the gap between students with and without a migration background widened over time – though even before the pandemic. These results underline the importance of considering effects of the pandemic across cohorts, large samples, and fine-grained assessments. We discuss our findings considering the context-specific educational challenges and in terms of practical implications for teachers' professional development.

Third Graders Mathematic Growth amid the Second Corona School Year in Austria
Presenting Author: Christoph Helm, Johannes Kepler University Linz, Austria; **Co-Author:**Christoph Weber, University of Education Upper Austria, Austria; **Co-Author:**David Kemethofer, University of Education Upper Austria, Austria

Since spring 2020, the COVID pandemic has led to repeated school closures across Europe and beyond. There is growing evidence that school closures and related remote teaching negatively affected student learning. Moreover, research suggests that school closures more strongly affected already disadvantaged students, thus widening social and ethnic disparities in achievement. In this study, we focus on the growth in mathematics skills of 279 Austrian 3rd graders during the second COVID school year 2020/2021. Applying piecewise latent growth curve modeling to learning progress assessment data (8 measurement points throughout the school year), we compare the learning gains (slope means) during the first half-year, which was disrupted by two remote teaching periods of a total of 7 weeks, with the learning gains of the second half year without remote teaching. The results do not show significant differences in the learning gains between the two half years. Although there are expected social and ethnic disparities at the beginning of the school year, there were no significant associations between learning gains and socioeconomic status and ethnic background (migration background, non-German family language), respectively. Thus, this study neither supports a learning loss, nor a widening of social and ethnic disparities during school closures and remote teaching.

Effects of the Covid-19 pandemic on the school performance of Swiss students
Presenting Author: Valentin Unger, St.Gallen University of Teacher Education, Switzerland; **Presenting Author:**Fabian Grünig, St.Gallen University of Teacher Education, Switzerland; **Co-Author:**Michael Kickmeier-Rust, University of Teacher Education, Switzerland; **Co-Author:**Jan Hochweber, St. Gallen University of Teacher Education, Switzerland; **Co-Author:**Nicolas Hübner, University of Tübingen, Germany; **Co-Author:**Christoph Helm, Johannes Kepler University Linz, Austria

In January 2020, the World Health Organization reported the first infections with the Covid-19 virus in Europe. To control the infections, schools all across the world, including Switzerland, were closed. As a result, students in Switzerland were in distance education for eight weeks – a short time compared to other countries. The school closures hit the stakeholders unprepared and revealed a wide range of questions and challenges. Studies on the impact of school closures suggested that beyond increased stress levels and mental health problems student performance severely suffered from school closings. However, the available evidence on learning losses due to the Covid-19 pandemic is characterized by a high degree of heterogeneity, which results besides other aspects from the fact that different coun-tries implemented different policies. To obtain evidence on effects of the Covid-19 pandemic policies enacted in Switzerland on students' achievement, we will evaluate longitudinal data from the digital learning support system "Lernpass plus". Data is available for grade levels 7 to 9 for 2019 (before school closures), 2020 (the year of school closure) and 2021 (the year when the pandemic persisted but school life returned to a fragile "normal" state) for core subjects.

Students' learning loss over the course of the COVID-19 pandemic – A Meta-Analysis
Presenting Author: Andrea Wisenöcker, Johannes Kepler University Linz, Austria; **Co-Author:**Christoph Helm, Johannes Kepler University Linz, Austria; **Co-Author:**Cornelia S. Große, Johannes Kepler University Linz, Austria, Austria

In spring 2020, the COVID-19 pandemic led to a global disruption of student's education around the world. Widespread school closures led to a shift from in-person learning at school to remote learning, with changes in education persisting over the following years. Our goal was to examine the average effect of the COVID-19 related school closures on k-12 students' achievement as well as to shed light on the development of achievement over the past two years. We did so by means of an AI-supported meta-analysis. The results indicate an average learning loss of Cohen's d = -0.176 (SE = 0.019, $p < 0.001$, 95% CI [-0.214, -0.138]), i.e., a learning loss within the range of summer learning losses. The moderator analyses yielded a significant effect of measurement time during the pandemic, while students' grades did not have a significant impact. Potential explanations as well as practical implications are discussed.

Session B 10

22 August 2023 15:00 - 16:30
AUTH_DC1
Single Paper

Learning and Social Interaction, Learning and Special Education

Learning and Developmental Difficulties: Screening and Assessment

Keywords: Achievement, Educational Policy, In-service Teachers, Inclusive Education, Learning and Developmental Difficulties, Learning and Developmental Disabilities, Mathematics/Numeracy, Meta-analysis, Primary Education, Quantitative Methods, Special Education, Teacher Efficacy, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education, SIG 15 - Special Educational Needs
Chairperson: Honghong Bai, China

Through the student's eyes: Perspective taking in student problem behavior
Keywords: Learning and Developmental Difficulties, Primary Education, Teacher Efficacy, Teacher Professional Development
Presenting Author: Hinke Endedijk, Leiden University, Netherlands; **Co-Author:**Tim Mainhard, Leiden University, Netherlands

Teachers often feel inefficacious when dealing with student problem behavior in class. During daily interactions teachers tend to deal with such behavior based on general implicit internal representations of a student, instead of taking a situational approach. These representations, however, are prone to various biases. The attribution error for example describes the tendency to attribute behavior to student-factors and underestimate situational factors. Building teachers' perspective taking skills is promising to change the teachers' view of student behavior and increase teachers' use of responsive strategies. Perspective taking encompasses the effort to understand a student's feelings, thoughts, motivations, and intentions in a given situation. We randomly assigned teachers to a control condition (N=45) in which teachers described a specific, real classroom situation or an experimental condition (N=29) in which they described the situation from the student's perspective (first person). Perspective taking, causal attributions and teacher's responsiveness were coded. A manipulation check confirmed more perspective taking in the experimental group (p = .001). Moreover, student behavior was explained more often by teacher behavior in the experimental group (p = .037). There was no indication of a difference in teacher's responsiveness. Based on these findings and following a perspective taking intervention (Mascio et al., under review), we constructed a guided perspective taking intervention for teachers consisting of a stepwise reflective process, in which teacher's describe a recent situation from the student's perspective, consider diverse contextual explanations, and plan ways to check their explanations in class. Initial findings of this ongoing project will be presented.

Arithmetic development from Grade 1 to 3 – The role of domain-specific and domain-general predictors
Keywords: Learning and Developmental Difficulties, Mathematics/Numeracy, Primary Education, Quantitative Methods
Presenting Author: Riikka Mononen, University of Oulu, Finland; **Co-Author:**Johan Korhonen, Åbo Akademi University, Finland; **Co-Author:**Markku Niemivirta, University of Eastern Finland, Finland

Basic arithmetic skills set the ground for later mathematics learning. Yet, we have relatively few longitudinal studies investigating arithmetic development and simultaneously effects of domain-specific and domain-general factors on this development. This study explored Norwegian children's (n = 261) development in arithmetic skills (addition and subtraction) from first to third grade, including four measurement time points. Arithmetic development was predicted by domain-specific (symbolic numerical magnitude processing and verbal counting) and domain-general (non-verbal reasoning, working memory, rapid automatized naming, attention) factors. Using latent growth curve modeling, first, we found an overall increase in arithmetic skills over time, with individual differences in both the initial level and change over time. Second, symbolic numerical magnitude processing, verbal counting, and central executive component of working memory were significant predictors of the initial arithmetic performance level at the first grade, while symbolic numerical magnitude processing and rapid automatized naming predicted growth. We conclude that both domain-specific and domain-general factors have a role in the development of arithmetic skills. Especially processing skills, both general and number-related, seem to influence the developmental change in children becoming more fluent in their calculations.

Diagnostic assessment of special educational needs in the field of learning disorders
Keywords: Educational Policy, In-service Teachers, Learning and Developmental Difficulties, Learning and Developmental Disabilities
Presenting Author: Ann-Kathrin Hennes, University of Cologne, Germany; **Presenting Author:**Lisa Dortants, Universität zu Köln/ University of Cologne, Germany; **Co-Author:**Julie Philippek, Universität zu Köln/ University of Cologne, Germany; **Co-Author:**Alfred Schabmann, University of Cologne, Germany; **Co-Author:**Barbara Schmidt, University of Cologne, Germany

In German federal states, the diagnosis of special educational needs (SEN) represents the formal basis for receiving special education support. In order to assess whether or not SEN are given and if so, in which specific area (e.g. learning) teachers must conduct a diagnostic process in which they consider the criteria for a determination of SEN. However, the legal framework only provides vague criteria. As a consequence, teachers must determine for themselves what criteria to using, meaning that SEN assessments are influenced by teachers' personal biases. To examine to what extent teachers really differ in the diagnostic procedures and criteria they use, the present study took a closer look at diagnostic practice. Therefore, 39 SEN assessments focused on learning disabilities carried out by different teachers in the federal state of Schleswig-Holstein were analyzed using criteria defining the procedure and content of an ideal SEN assessment. The results show that teachers use different criteria when deciding whether or not special education support is needed. The most frequent reason for the decision was the child's intelligence. Furthermore, most assessments were not fully comprehensible in terms of theoretical foundation and diagnostic methods used. In light of those results, the potential benefits of diagnostic standards and possible principles that could underlie them are discussed.

A meta-analysis of teacher screening and progress monitoring assessments: Preliminary findings
Keywords: Achievement, Inclusive Education, Meta-analysis, Special Education
Presenting Author: Serap Keles, Knowledge Centre for Education, University of Stavanger, Norway; **Co-Author:**Dieuwer ten Braak, University of Stavanger, Norway; **Co-Author:**Åste Marie Mjelve Hagen, University of Oslo, Norway; **Co-Author:**Monica Melby-Lervåg, University of Oslo, Norway

The three-tier model, which has been in use for several years in, for example the US and Finland, has been a recommended approach for inclusive education to tackle the diversity of learning challenges and special educational needs. It serves as a framework for structuring and systematizing educational support in various tiers (i.e., general support, intensified support, and special support) in line with the students' needs (Sundqvist et al., 2019). A critical issue for the successful implementation of the three-tier model is correctly allocating children to tiered interventions of appropriate intensity. Screening and progress monitoring assessments are often used to detect the need of extra support and a variety of instruments have been used for this purpose. However, it is unclear which of these assessments are valid in placing children in the different tiers and whether screening is an effective preventive method that improves children's future academic outcomes. Hence, the aim of this meta-analysis is to evaluate the validity and effectiveness of teacher screening and progress monitoring assessments within the three-tier model across academic achievement outcomes. Through a comprehensive literature search of both published and grey literature in six databases and search engines, 9961 studies were identified in line with the a priori defined inclusion criteria. We are currently in the process of a two-stage independent double screening. Preliminary findings of the eligible studies included through the screening procedure will be presented.

Session B 11

22 August 2023 15:00 - 16:30
UOM_A04
Single Paper
Motivational, Social and Affective Processes

Achievement in Mathematics: Motivational Beliefs, Emotions and Effort

Keywords: Achievement, Attitudes and Beliefs, Educational Attainment, Emotion and Affect, Engagement, Interest, Mathematics/Numeracy, Motivation, Primary Education, Science and STEM, Secondary Education, Self-concept, Self-regulated Learning and Behaviour
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Despoina Georgiou, Utrecht University, Netherlands

Beliefs and mathematics achievements : association with attitudes and motivation
Keywords: Attitudes and Beliefs, Educational Attainment, Mathematics/Numeracy, Motivation
Presenting Author: Achmad Hidayatullah, University of Szeged, Doctoral School of Education, Indonesia; **Co-Author:**Csaba Csíkos, University of Szeged, MTA-SZTE Metacognition Research Group, Hungary

Describing the factors behind students' achievement in mathematics is a challenge for mathematics educators and researchers. Some researchers suggested that beliefs, attitudes, and motivation were factors that played key roles in determining students' achievements. However, there is a scarcity of investigations into the simultaneous contribution of these factors in mathematics. The purpose of this study is to examine the relationship between beliefs, attitudes, motivation, and mathematics. This study involved 894 (boys = 448 and ladies = 446) students from fifth and sixth grades in Surabaya, the capital of East Java Province in Indonesia. Participants completed questionnaires consisting of items on beliefs, attitudes, motivation, and self-report achievements in mathematics. Structural equation modeling (SEM) was performed to analyze the data. The results suggest that beliefs, attitudes, and motivation significantly influence students' achievements. Beliefs also significantly influence attitudes and motivation. Attitude partially mediated the relationship between beliefs and achievements. Motivation also mediated beliefs and achievements. The finding of this study contributes to unpacking the relationship between beliefs, attitudes, motivation, and mathematics achievement in mathematics learning.

Profiles of control, value and achievement emotions in primary school mathematics lessons.
Keywords: Achievement, Educational Attainment, Emotion and Affect, Primary Education
Presenting Author: Dave Putwain, Liverpool John Moores University, United Kingdom; **Co-Author:**Wendy Symes, University of Potsdam, Germany; **Co-Author:**Stephanie Lichtenfeld, Universität Hamburg, Germany

Achievement emotions are posited to arise as a result of control-value appraisals. However, it is unclear how these beliefs relate to combinations of emotions, and how these combinations relate to achievement. The present study performed a latent profile analysis of control and value beliefs, and emotions, to investigate heterogeneity in emotion profiles in a large sample of primary school students during mathematics lessons. Four profiles emerged: Profile one (the 'high enjoyment' profile) was characterized by the highest levels of control, values and enjoyment, and the lowest levels of anxiety and boredom, whilst profile two (the 'high boredom' profile) was characterised by the opposite pattern. Students in profile three (the 'moderate enjoyment' profile) had higher intrinsic value, control and enjoyment than students in profile four, whilst students in profile four (the 'moderate boredom' profile) had higher boredom. Overall, the largest differences were found between students' intrinsic value and enjoyment and boredom, suggesting that this type of value may be particularly important in the development of primary school students' emotions. Students in profile one had significantly higher mathematics test scores at the end of the study (controlling for prior achievement) than students in profiles three and four, but not profile two. Our findings suggest that it may be beneficial to further investigate how different profiles of control and value beliefs and emotions interact to influence learning and achievement.

State-Trait Analyses of STEM Students' Math-Related Motivations In Low-Stakes Achievement Settings
Keywords: Interest, Motivation, Science and STEM, Self-concept
Presenting Author: Daria Katharina Benden, University of Bonn, Germany; **Co-Author:**Fani Lauermann, University of Bonn, Germany

Students in science, technology, engineering, and mathematics (STEM) majors often experience achievement difficulties and motivational declines, especially at the beginning of their studies. Motivation research has increasingly focused on the students' situation-specific motivations, showing that short-term motivational changes can be a warning sign of long-term declines. However, little is known about the extent to which students' motivational beliefs in a given achievement situation are driven by general attitudes towards math or by specific features of the situation (e.g., the math content students are asked to work on), and whether different groups of students differ in their trait-like versus situation-specific motivations. Building on Eccles' *situated* expectancy-value theory, we examined interindividual differences in trait versus state proportions of students' situation-specific expectancy-value beliefs while taking a low-stakes math test of math prerequisites for studying in a STEM field, provided by the state ministry of education. Beginning postsecondary students enrolled in STEM programs took the test during class time and were randomly assigned to different math content (N=3,217). Multigroup multitrait-multistate models showed that a substantial amount of variance was due to trait rather than state factors (i.e., content-independent consistency). Multigroup comparisons revealed few gender differences but interindividual differences emerged for students' prior achievement. Students with lower math grades and those who had taken regular rather than advanced math courses in high school had generally more stable motivations about tested content. These findings show that trait-like beliefs about math may overshadow situation-specific experiences so that students' motivations can be difficult to change in some settings.

The Role of Effort in Students' Mathematics Development: Investigating its Predictors and Outcomes
Keywords: Engagement, Motivation, Secondary Education, Self-regulated Learning and Behaviour
Presenting Author: Robin Nagy, UNSW, Australia; **Co-Author:**Andrew Martin, University of New South Wales, Australia; **Co-Author:**Rebecca Collie, University of New South Wales, Australia

Effort has been identified in many theories of education and psychology as an essential component of students' academic development and driver of key learning processes and outcomes. However, despite ubiquitous references in major theoretical frameworks, little research has been conducted into effort itself. The present research defines effort as active, purposeful and energetic investment in learning, operationalised through cognitive, operative, and social-emotional dimensions, resulting in an overarching higher-order effort factor. The aims of this research are to examine how the key antecedents of student motivation and teacher-student relationship predict gains in students' effort in the mathematics classroom, and to explore the relation between these gains in effort and gains in students' mathematics achievement over a six-month period. Data were collected at two timepoints (Term 2 and Term 4 2020) from 1,548 secondary school students and 72 teachers in 114 mathematics classes from years 7-10 in nine Australian independent schools. Data were analysed using multilevel confirmatory factor analyses and multilevel path analyses. Longitudinal results demonstrated: 1) motivation and teacher-student relationship as unique predictors of student effort gains; 2) motivation and teacher-rated effort as unique predictors of achievement gains; and 3) classroom-average motivation as a unique predictor of classroom-average effort gains.

Session B 12

22 August 2023 15:00 - 16:30
UOM_A08
Single Paper
Assessment and Evaluation, Educational Policy and Systems, Lifelong Learning

Educational Effectiveness and School Improvement

Keywords: Achievement, Assessment Methods, Communities of Learners and/or Practice, Educational Policy, Mixed-method Research, Parental Involvement in Learning, Qualitative Methods, Quantitative Methods, Researcher Education, School Effectiveness, School Leadership, Secondary Education, Synergies between Learning / Teaching and Research
Interest group: SIG 01 - Assessment and Evaluation, SIG 18 - Educational Effectiveness and Improvement, SIG 25 - Educational Theory
Chairperson: Inmaculada Fajardo, Spain

School improvement capacity in average-performing schools
Keywords: Communities of Learners and/or Practice, Mixed-method Research, Qualitative Methods, School Effectiveness
Presenting Author: Beat Rechsteiner, University of Zurich, Switzerland; **Co-Author:**Lisa Maria Schaefer, Johannes Gutenberg University of Mainz, Germany; **Co-Author:**Claudia Marusic-Würscher, Zurich University of Teacher Education, Switzerland; **Co-Author:**Katharina Maag Merki, University of Zurich, Switzerland; **Co-Author:**Andrea Wullschleger, University of Applied Sciences and Arts Northwestern Switzerland PH (FHNW), Switzerland

If we claim that education is "a hope in uncertain times" capacity for change is an indispensable factor for schools and educational systems. In school

improvement research, we are investigating factors for sustainable and effective change. Synoptic models and theories on school improvement factors show considerable overlap and consistency for decades, while in practice, the percentage of schools that show all the required ingredients for “baking the cake of school improvement” remains low. We argue that transfer difficulties here might be caused by the focus of school improvement research itself. The ongoing discussion reveals a need for more attention on schools that are neither high- or low-performers or turn-around schools. These schools are the majority and provide practical knowledge that is not only based on organizations that perform best practices. There is also a need for understanding of the root causes of the difficulties and interrelations of different improvement factors leading to a deeper understanding of the individual school's situation. To address these shortcomings, in our study, we focused on average-performing schools, which we identified based on profile building with 59 primary schools in a mixed methods sequential design. We, thereby, combined different multi-level perspectives and mixed methods strategies for a more differentiated understanding of the underlying mechanisms of improvement activities. For a type of average-performing school - the harmonic-avoiding type - our findings reveal that the staff members' aspiration for harmonic climate on the team level is prohibiting a discussion on dissent and a goal-oriented formal implemented school improvement.

A Model of Complex Data Analysis for Improving Student Achievements
Keywords: Achievement, Assessment Methods, School Effectiveness, School Leadership
Presenting Author: Pavels Pestovs, University of Latvia, Latvia; **Co-Author:**Dace Namsone, University of Latvia, Latvia

Countries all over the world are trying to improve schools to enhance the skills of their youth and to reduce the inequalities within society. The study aims to pilot a model of complex data analysis for improving student achievements and identify complex causal structures of student achievements. The model is conceptualised in terms of basic systems models with inputs, processes, outputs, and context of schools. Specifically, it investigates national-level students assessment data, teacher performance in the classroom, elements of school leadership practices and teacher collective efficacy as key variables to explore student achievements and develop school improvement plan. Data triangulation helps to identify relationships between model components and hypothesise complex causal structures of student achievements.

Research as an Institutional Practice: Problems and Suggested Improvements
Keywords: Qualitative Methods, Quantitative Methods, Researcher Education, Synergies between Learning / Teaching and Research
Presenting Author: Mark WHite, University of Oslo, Norway

The propagation and continuation of problematic research practices poses an important challenge to the validity of research knowledge. Many problematic research practices have been well-known for decades, but the prevalence of these problematic practices has, if anything, spread across time. Explanations for the propagation of problematic research practices, focused on structural features of the scientific field are incomplete, implying that scientists intentionally engage in problematic practices to get ahead. This paper proposes an alternative, but consistent, explanation of the propagation and continuation of problematic research practices. Namely, as research practices spread, they develop into institutionalized methodologies (i.e., well-defined sets of practices) that address specific key problems in drawing valid conclusions. As such, a logic of confidence arises around methodologies, taking for granted their ability to address key problems. This logic of confidence is never challenged within the daily usage of research methodologies, as many methodologies do not provide evidence of their applicability to a specific instance (e.g., estimating $p< 0.05$ does not provide strong evidence for whether the p-value can be used to support the inductive inference, rather one must first accept the p-value is valid and then interpret it). Bolstered by the logic of confidence and without any contravening evidence, the effectiveness of research methodologies becomes an object of faith. Combating the spread of problematic research practices, then, involves rethinking the design of methodologies, such that the usage of a methodology provides evidence for the validity of conclusions drawn from using the methodology.

Navigating the invisible boundary, factors that support the transition to secondary school.
Keywords: Educational Policy, Parental Involvement in Learning, Qualitative Methods, Secondary Education
Presenting Author: Emma Cunningham, University of Waikato, New Zealand

Transitions are an immanent feature of lifespan development, as all individuals experience distinct turning points, usually followed by periods of adjustment (Pallas, 1993). Gale and Parker (2014) define “transition as the capability to navigate change” (p. 737). Studies conducted in Aotearoa New Zealand and internationally highlight that ill-planned transitions into secondary school can impact negatively on student wellbeing, motivation and academic achievement (Benner, 2011; Ministry of Education, 2010). Positive transition experiences for students beginning secondary school are strongly correlated with student retention until graduation (Boonk et al., 2018; Mac Iver et al., 2015). This presentation shares on the experience of navigating the transition to secondary school through the intersection of data from two complementary, qualitative studies. Theoretically, both studies adopt an ecological lens to examine the micro and mesosystemic role of schools and parental support during the transition to secondary school (Bronfenbrenner & Ceci, 1994). The first study investigated the transition through the storied experiences of a group of Pacific students and their parents. The second study examined collaborative practices occurring between middle school and secondary school leaders responsible for facilitating the transition of students to secondary school. Triangulation of both data sets emphasised the dual contribution of parental support and school leadership practices to promote positive experiences during the transition to secondary school.

Session B 13

22 August 2023 15:00 - 16:30
UOM_A03
Single Paper
Learning and Instructional Technology, Teaching and Teacher Education

Video-based Learning and Teacher Professional Vision

Keywords: Cognitive Skills and Processes, Eye Tracking, Feedback, Higher Education, In-service Teachers, Instructional Design, Multimedia Learning, Pre-service Teachers, Qualitative Methods, Teacher Professional Development, Teaching Approaches, Video-based Learning
Interest group: SIG 06 - Instructional Design, SIG 11 - Teaching and Teacher Education
Chairperson: Jean-Luc Patry, Paris-Lodron University Salzburg, Austria

Signaling, self-explanations, and situational interest in preservice professional vision training
Keywords: Cognitive Skills and Processes, Instructional Design, Pre-service Teachers, Video-based Learning
Presenting Author: Meg Farrell, Technische Universität München, Germany; **Co-Author:**Monika Martin, University of Education Freiburg, Germany; **Co-Author:**Ricardo Böheim, Technical University of Munich, Germany; **Co-Author:**Alexander Renkl, University of Freiburg, Germany; **Co-Author:**Werner Rieß, PH Freiburg, Germany; **Co-Author:**Karen Könings, Maastricht University, Netherlands; **Co-Author:**Jeroen Van Merrienboer, Maastricht University, Netherlands; **Co-Author:**Tina Seidel, Technische Universität München, Germany

Video-analysis offers opportunities for preservice teachers to apply conceptual knowledge of teaching and learning toward real-world settings. This noticing and reasoning training about core teaching practices helps them develop professional vision skills. While learning with video can be motivating, processing challenges can arise for novices due to the transient nature of information flow. Multimedia learning research emphasizes the use of instructional design techniques to offer support, such as signaling keyword cues during video viewing, or presenting analysis self-explanation prompts focused on target knowledge for application. This study investigates the professional vision performance (i.e., describing and interpreting relevant noticed events) of 130 preservice teachers participating in a video-analysis training focused on small group instruction. We examine the overall effectiveness of the training, and inquire whether the instructional design techniques of signaling cues and focused self-explanation prompts offer further support. Finally, we explore the moderating role of situational interest on technique effects. We found that preservice teachers’ professional vision skills significantly improved after the video-analysis training, but cues and focused-prompts did not offer further support. However, moderation results indicate that when preservice teachers have low interest, videos with cues supported their professional vision more than without cues. Findings suggest that for preservice teachers lacking interest, the cueing effect may compensate for the generative processing boost typically associated with situational interest. Implications for research and practice are to consider situational interest as a powerful instructional design component for generative processing support, but when interest is difficult to elicit, cues may help.

Video-based intervention to foster pre-service teachers' professional vision of feedback
Keywords: Feedback, Pre-service Teachers, Teaching Approaches, Video-based Learning
Presenting Author: Anna Holstein, Leuphana University Lueneburg, Germany; **Co-Author:**Christopher Neil Prilop, Aarhus University, Denmark; **Co-Author:**Kira Elena Weber, Kiel University, Christian Albrecht Universität zu Kiel, Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Marc Kleinknecht, Leuphana University Lueneburg, Germany

Professional vision is an important element of a teacher's professional competence and comprises noticing and interpreting (describing, explaining, generating alternative courses of action) relevant classroom events. Most studies that focus on professional vision concentrate on classroom management, whereas other teaching dimensions, such as teacher-student-feedback, are hardly taken into account. Yet, recent studies show that (pre-service) teachers have trouble providing effective feedback and already need practice opportunities during teacher training. So the study at hand examines to what extent a video-based intervention about teacher-student-feedback (intervention group) can foster pre-service teachers' professional vision of feedback compared to a control group. Our results display that the intervention group yielded significantly better results when it comes to noticing relevant feedback events. For knowledge-based reasoning, the intervention group was also significantly better at describing the events. Yet, there were not significant differences for the facets explaining and generating alternative courses of action.

Potentials of different perspectives of classroom videos for fostering teachers' professional vision
Keywords: Eye Tracking, Higher Education, Teacher Professional Development, Video-based Learning
Presenting Author: Sara Mahler, PH FHNW Switzerland, Switzerland; **Co-Author:**Kerstin Baeuerlein, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland; **Co-Author:**Corinne Wyss, FHNW School of Education, Switzerland

Working with classroom videos in teacher education has become increasingly prominent over the last fifteen years worldwide. The potential that classroom videos offer for teacher education has been investigated and documented in numerous studies (Gaudin & Chaliès, 2015). So far, mainly recordings from the "observer's perspective" have been used. Thanks to mobile eye tracking technology (MET), it has become possible to see the teaching through the teacher's eyes. MET recordings show the gaze of teachers during teaching and thus open up new possibilities for working with classroom videos in teacher education. However, such recordings have rarely been used so far (Stürmer et al., 2017) and findings on didactic benefits are still scarce.This study investigates the specific potential of different perspectives of classroom videos to foster professional vision (Seidel & Stürmer, 2014). Pre-service (n=32) and in-service (n=20) teachers viewed excerpts from classroom videos that were recorded with MET as well as from two different "observer perspectives" (student and teacher perspective). Structured interviews were used to investigate what the subjects observed and how they interpreted the observed classroom events (professional vision) depending on the video perspective. The results show specific potentials and limitations of the different video perspectives. Depending on the perspective, other classroom features are perceived. For example, the observer perspective supports a holistic perception (e.g., the classroom climate), while the MET videos draw the focus more to specific details (e.g., an individual student's learning behaviour). Consequences for the use of classroom videos to foster professional vision are discussed.

Which explainer video is "the one to choose"? Insights into how teachers select explainer videos
Keywords: In-service Teachers, Multimedia Learning, Qualitative Methods, Video-based Learning
Presenting Author: Felicitas Licht, University of Giessen, Germany; **Co-Author:**Marie-Christin Krebs, University of Giessen, Germany; **Co-Author:**Alexander Eitel, University of Giessen, Germany

We investigated what teachers know about effective video design according to multimedia design principles, and whether they actually use this knowledge to select the (likely) most effective videos for educational purposes. In an online study, we asked teachers first about their use of videos in their (online) teaching and their previous selection criteria for suitable videos. Then, we presented them with a short teaching scenario, and asked them to watch two short video sequences that adhered more to cognitive design principles, to motivational design principles, or to neither of the two. After that, the teachers selected one of the video sequences for the scenario and stated the reasoning for their selection. Preliminary results suggested that most of the teachers (60%) relied on previously self-set criteria, while another part relied solely on their gut feeling (15%). On average, the accuracy of the content was the most important factor for the teachers when selecting a video. When given a choice, the teachers selected a video sequence in line with motivational design principles (63%) to a similar extent than a video sequence in line with cognitive design principles (61%). In about 40% of the cases the teachers chose a video that neither adhered to cognitive nor motivational design principles. Overall, our findings suggest that evidence-based principles on effective video design are not sufficiently known and applied in educational practice. Consequently, this should be a stronger focus in teacher education and training.

Session B 14

22 August 2023 15:00 - 16:30
UOM_R08
Single Paper
Higher Education

Different Aspects of Inclusive Education

Keywords: Achievement, Assessment Methods, At-risk Students, Economics of Education, Educational Attainment, Educational Policy, Higher Education, Inclusive Education, Qualitative Methods, Quantitative Methods
Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education
Chairperson: Lito Eleni Michalopoulou, Aristotle University of Thessaloniki, Greece

The effect on achievement of an orientation track for first-year students: a longitudinal study
Keywords: Achievement, Higher Education, Inclusive Education, Quantitative Methods
Presenting Author: Dorien Jansen, Hogeschool PXL, Belgium; **Co-Author:**Philippe Haldermans, Hogeschool PXL, Belgium; **Co-Author:**Heidi Croes, Hogeschool PXL, Belgium

This study aims at investigating the predictive value of an orientation track, personal characteristics, and guidance and support of freshmen on their study efficiency, length of study and likelihood of obtaining a Bachelor degree. A longitudinal design was set up over a course of nine years, combining data regarding all variables. This data was analysed using descriptive statistics, correlations and regression models. This study showed that the results after the first examination period were most predictive for the academic success of students in higher education, combined with some personal characteristics, such as gender and prior academic experience in secondary education. Based on these results, students in higher education with specific characteristics or results after the orientation track can be targeted sooner in order to increase their academic success or to redirect the student to another bachelor's or associate degree. Additionally, by investigating data over a course of nine years, specific trends regarding the enrollment of students with specific characteristics (personal, results of the orientation track or results after the first examination period or resit) can be detected. This is important information for the policy and decision making process in the higher education institution. Lastly, the analyses of big data and learning analytics yielded important information and tips and tricks in order to repeat this study every three or five years. The tips and tricks can also be transferred to other research including big data collections and data analysis.

Promoting Access through Affordability: A Systematic Review of Open Educational Resources
Keywords: Economics of Education, Educational Attainment, Higher Education, Inclusive Education
Presenting Author: Amber Mullens, University of Central Florida, United States; **Presenting Author:**BOBBY HOFFMAN, University of Central Florida, United States

The escalating cost of higher education creates economic and academic hardships for many students. Adopting free materials such as open educational resources (OER) is one strategy for reducing educational costs. OER are typically electronic instructional materials that are copyrighted under a license that

allows for free student use. Effective implementation of OER requires a consideration of user perceptions, resource efficacy, and barriers to adoption. Thus, 96 peer-reviewed journal articles published between 2002 and 2022 were systematically reviewed (Newman & Gough, 2020) using PRISMA standards (Page et al., 2021) to answer three research questions: (a) what are student and faculty perceptions of OER, (b) which incentives and barriers impact OER adoption and use, and (c) what is the impact of OER on student achievement? Findings suggested that students have positive views of OER and believe the resources facilitate engagement. Faculty generally affirm that OER are of similar quality to paid instructional materials, but administrative obstacles inhibit adoption. Student academic performance is stable when using OER, and especially beneficial for at-risk student achievement. Practical implications for instructors and researchers are advanced to mitigate barriers toward OER utilization and to enhance the potential for academic equity and effectiveness.

How do students with the diagnosis autism specter disorder master higher education
Keywords: At-risk Students, Educational Policy, Inclusive Education, Qualitative Methods
Presenting Author: Liv Håberg, Volda University College, Norway; **Presenting Author:**Kari Rygg, Inviro, Norway

The aim of the study is to investigate how students with the diagnosis autism specter disorder (ASD) master higher education (HE), and to examine the extent to which the institutions inform and offer relevant support in the students' course of study. The study was carried out in Norwegian HE, which has clear guidelines and political goals to facilitate students in need of extra support and facilitation. The study has used two kinds of approaches. Firstly, by examining what information can be found on the HE institutions' websites about accommodation for students with ASD. Secondly, through interviewing 6 students who themselves have the diagnosis. The data collection has been carried out in autumn 2022. Preliminary findings show that the websites from HE in Norway deal to a small extent with students with ASD. The information is fragmented and to some extent not readily available. The interview data will later be analyzed and interpreted much more thoroughly, but preliminary findings point to that students with ASD may find it difficult to ask for help. The findings are discussed in the light of both the Norwegian educational policy for HE, and the special needs associated with the diagnosis of ASD, such as structure and predictability in unfamiliar situations. When HE does not provide sufficient support, socio-economic inequalities can manifest to a greater extent, which hits students with ASD extra hard. Education then no longer becomes a hope in an uncertain time.

Examination experiences of university students with disabilities before and during the pandemic
Keywords: Assessment Methods, Higher Education, Inclusive Education, Qualitative Methods
Presenting Author: Margaret Bearman, Deakin University, Australia; **Co-Author:**Joanna Tai, Deakin University, Australia; **Co-Author:**Paige Mahoney, Deakin University, Australia; **Co-Author:**Rola Ajjawi, Deakin University, Australia; **Co-Author:**Jo Dargusch, Central Queensland University, Australia; **Co-Author:**Mary Dracup, Deakin University, Australia; **Co-Author:**Lois Harris, Central Queensland University, Australia

As a form of assessment, examinations are designed to determine whether university students have met learning outcomes. However, many students with disabilities report challenges with exams that lead to feeling ‘othered’ and increase stress and anxiety. To ensure examinations do not contribute to the systematic exclusion of students with disabilities, it is important to explore their experiences. In this paper, we use a sociomaterial sensibility to attune to how examination arrangements impact upon inclusion. Interview and asynchronous data were collected from 51 students with disabilities across two universities during a period of upheaval, as assessment paradigms rapidly shifted due to the Covid-19 pandemic. Both prior to and during the pandemic, students were excluded through emergent combinations of social and material arrangements. Access to material conditions occurred in tandem with staff acceptance and implementation of access requirements. Pandemic-related changes such as shifting examinations online, using technology, increasing time limits and moving to open-book examinations contributed to increased inclusion for many, but not all, students. While some exclusionary behaviours persisted, the pandemic upheaval may have also created space to move towards positive long-term changes, reducing the need for adjustments and facilitating broader inclusion.

Session B 15

22 August 2023 15:00 - 16:30
AUTH_DC3
Single Paper
Higher Education, Motivational, Social and Affective Processes, Teaching and Teacher Education

Fostering Self-regulated Learning: Individual and Instructional Factors

Keywords: Educational Attainment, Emotion and Affect, In-service Teachers, Learning and Developmental Difficulties, Learning Strategies, Metacognition, Motivation, Self-regulated Learning and Behaviour, Tool Development
Interest group: SIG 08 - Motivation and Emotion, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Jose Hanham, Australia

Examining the psychometric power of the SRL Profile and Self-diagnostic scale
Keywords: Learning Strategies, Metacognition, Self-regulated Learning and Behaviour, Tool Development
Presenting Author: Allyson Hadwin, University of Victoria, Canada; **Co-Author:**Ramin Rostampour, University of Victoria, Canada; **Co-Author:**Michelle Bahena-Olivares, University of Victoria, Canada; **Co-Author:**Philip Winne, Simon Fraser University, Canada

This study examined psychometric adequacy and predictive validity of the self-regulated learning profile and self-diagnostic instrument (SRL-PSD). The SRL-PSD makes three important contributions to research and practice. First, subscales tap into phases and facets of SRL underrepresented in other measures of SRL (e.g., Task understanding, Metacognitive monitoring, and Adaptation). Second, the scale assesses academic difficulties students encounter in five areas relating to academic success (e.g., cognitive, behavioural, motivational, socio-emotional, and metacognitive challenges). Third, the scale provides immediate diagnostic information as a personalized profile to guide future strategy choice and intervention. Findings confirmed the measurement adequacy of (a) 6 academic challenges strongly associated with semester academic performance (GPA), (b) 8 self-regulated learning practices strongly associated with academic challenges and academic performance (GPA), (c) 3 SRL self-efficacy factors and 3 SRL importance factors strongly associated with GPA. Analyses of the predictive validity of factors within each subscale demonstrate need for research examining nuances in the ways specific SRL practices and academic challenges function together to contribute to academic outcomes

Fostering Self-Regulated Learning with a Learning Diary: Success Factors
Keywords: Emotion and Affect, Learning Strategies, Motivation, Self-regulated Learning and Behaviour
Presenting Author: Thomas Martens, Medical School Hamburg, Germany; **Co-Author:**Diana Pistoll, Medical School Hamburg, Germany

The effect of a learning diary fostering self-regulated learning is examined in two combined longitudinal and intervention studies. Specifically, self-reflection processes on learning methods and strategies were promoted that aim at the intention phase of the Integrated Model of learning and Action (IMLA). In a first study n=157 7th and 8th grade pupils were examined at a district school in Northern Germany, of which two 8th classes with n=29 took part in the 6-week intervention. Each week a learning method, such as mind-mapping, was tried out with the help of the learning diary. This was supported by short weekly one-to-one interviews with university students. Before and after the intervention period all pupils completed a questionnaire with the most important constructs of the IMLA and a scale on social emotional support. The analysis of the data was done with the Rasch model as well as ANOVAs with repeated measures and moderator analysis. In a second study at the same school n=128 6th and 7th grade pupils were examined with roughly the same intervention and the same methods. The invention group was composed of two 7th classes with n=36. This time trained pupils from the upper secondary school implemented and supervised the learning diary. In study 1, the results show a significant effect on self-efficacy and success experience in the learning diary group. Perceived social emotional was identified as moderator. In study 2, these results could not be replicated. General success factors for implementing a learning diary for self-regulated learning are discussed.

The impact of SRL instruction in task understanding, academic challenges, and performance
Keywords: Educational Attainment, Learning and Developmental Difficulties, Metacognition, Self-regulated Learning and Behaviour

Presenting Author: Michelle Bahena, University of Victoria, Canada; **Co-Author:**Allyson Hadwin, University of Victoria, Canada; **Co-Author:**Ramin Rostampour, University of Victoria, Canada; **Co-Author:**Muqing Nie, University of Victoria, Canada

Task understanding (TU) is a critical and understudied phase in the self-regulated learning process (Winne & Hadwin, 1998). In this study, SEM was used to examine whether self-regulated learning instruction moderates the impact of task understanding practices on reports of academic challenges during studying. We hypothesized that SRL instruction would better prepare students to leverage task understanding practices in ways that minimize experiences with academic challenges (N = 431). Findings indicated that TU practices negatively predicted all six academic challenges: goal and time management, initiating and sustaining engagement, motivation, cognitive, metacognitive, and social-emotional challenges. Moreover, results showed SRL instruction significantly moderated TU practices' influence on five challenges, except for social and emotional challenges. In other words, the potency of task understanding for mitigating challenges is increased when students have been trained in effective use of SRL practices.

Self-regulated learning of teachers and its connections to the competencies of their students
Keywords: In-service Teachers, Learning Strategies, Metacognition, Self-regulated Learning and Behaviour
Presenting Author: Yves Karlen, University of Zurich, Switzerland; **Co-Author:**Silke Hertel, Ruprecht-Karls-Universität Heidelberg, Germany; **Co-Author:**Johannes Jud, University of Zurich, Switzerland; **Co-Author:**Carmen Nadja Hirt, University of Zurich, Switzerland

Competencies in self-regulated learning (SRL) are considered important educational goals (OECD, 2019) as SRL skills are essential for successful learning in school and beyond. Thus, promoting SRL in the classroom is an important aspect of everyday school life. To promote SRL, teachers need to have professional competencies in SRL. So far, teachers' SRL and students' SRL are rarely studied together. Based on a multilevel approach, this study investigates the relevance of teachers' professional competencies and their SRL promotion in class for students' SRL competencies. N = 2,443 lower secondary school students (48.9% female; M_{age} = 14.45) from N = 158 classes and their teachers (44.4% female; M_{age} = 44.34) participated in this study. The results of the multilevel analyses indicate that teachers' self-efficacy is related to their SRL promotion in class but not to their beliefs and knowledge. The results underline the importance of teachers' SRL promotion for students' metacognitive strategies usage and motivational regulation skills. However, teachers' SRL promotion was not related to students' metacognitive knowledge about strategies. Overall, the results highlight the importance not only of supporting teachers in how to teach strategies but also of showing them how to develop the metacognitive knowledge of their students.

Session B 16

22 August 2023 15:00 - 16:30
AUTH_T202
Single Paper
Assessment and Evaluation, Educational Policy and Systems, Lifelong Learning

Assessment Methods in Vocational Education

Keywords: Assessment Methods, Competencies, Digital Literacy and Learning, Engineering Education, Feedback, Quantitative Methods, School Leadership, Teaching/Instructional Strategies, Video-based Learning, Vocational Education and Apprenticeship Training
Interest group: SIG 01 - Assessment and Evaluation, SIG 14 - Learning and Professional Development
Chairperson: Cheuk Ming Ho, The Education University of Hong Kong, Hong Kong

Entrepreneurship Competence in VET: results from Italy
Keywords: Assessment Methods, Competencies, Teaching/Instructional Strategies, Vocational Education and Apprenticeship Training
Presenting Author: Daniele Morselli, Free University of Bolzano, Italy

This study is part of larger study commissioned by CEDEFOP on how an entrepreneurship competence is developed in VET and leans on the case study. The research In Italy has implied: the analysis of policy documents at the State level; interviews with experts, and field research at selected six VET institutions. The data were analysed according to a qualitative and descriptive approach. Through integrating various types of sources such as policy documents, interview to stakeholders and field research at VET institutions, this research is meaningful in that it offers a full picture on how an entrepreneurship competence is developed in the Italian VET system.

Exploring VET student, workplace and school tutor viewing and evaluation of work practice
Keywords: Assessment Methods, Feedback, Video-based Learning, Vocational Education and Apprenticeship Training
Presenting Author: Sietse Brands, University of Twente, Netherlands; **Co-Author:**Bas Kollöffel, University of Twente, Netherlands; **Co-Author:**Elwin Savelsbergh, Universiteit Utrecht / Hogeschool Utrecht, Netherlands; **Co-Author:**Maaike Endedijk, University of Twente, Netherlands

Dual vocational education students receive guidance both at school and at the workplace. But the feedback they receive at the workplace differs from that received at school. While organizational priorities play a role, we hypothesize that situatedness (work experience and work culture) of tutors influences their view on practice and ultimately the guidance they give to students. In the current study we explored how school and workplace based tutors and students view video recordings of common work situations. In electrician education, eleven students, eleven school tutors and seven workplace tutors viewed five recordings and evaluated the task performances. Participant verbalizations were transcribed and analysed based on the framework of situational awareness. We explored perceived task elements, interpretations and evaluation quantitatively and qualitatively. Students were found to notice less elements and differ in their interpretations and evaluations from tutors. Workplace and school based tutors also differ in their perspectives on good practice. While these groups did not differ in the perceived elements of performance, their interpretations and evaluations differed. Showing that standardized safety protocols were interpreted very differently. We conclude that students are prone to pick up approaches taught at their workplace, which might lead to problems when these are not conform protocols. The differences in school and workplace based tutors perspectives on practice can form a problem for uniform educational outcomes. Future research could focus on ways to help students notice and evaluate workplace situations and make sense on different perspectives on practice in their field.

Digital measurement of hands-on skills? Validation of a computer-based automotive repair test
Keywords: Assessment Methods, Competencies, Engineering Education, Vocational Education and Apprenticeship Training
Presenting Author: Stefan Hartmann, Ludwigsburg University of Education, Germany; **Co-Author:**Emre Güzel, Ludwigsburg University of Education, Germany; **Co-Author:**Tobias Gschwendtner, Ludwigsburg University of Education, Germany

We investigate the ecological validity of the test score interpretations from a computer-based assessment tool (CBA) that utilises scripted video vignettes to measure the maintenance and repair skills of apprentice light vehicle technicians. The intended purpose of this tool is to complement traditional hands-on assessment formats at the German journeymen's exams. We hypothesise that the CBA test scores reflect procedural knowledge and therefore are valid predictors of hands-on performance. Apprentices in the third year of apprenticeship carried out repairs on three car systems (brake, lighting, and engine), while experts examined their performance. Afterwards, the examinees worked on our CBA which aims at the same systems. The association between hands-on performance and the CBA scores was low for most repair actions, indicating insufficient ecological validity of the intended test score interpretation. However, there is promising evidence at the item level, as the results of *some* CBA items correspond highly with the related hands-on tasks. We discuss the results in the light of a wider validation framework that combines validity evidence from different sources for our CBA. We conclude that while it seems generally possible to develop ecologically valid computer assessments that aim on certain hands-on skills, several of the items in our tool do not yet meet our expectations in regard of ecological validity. We make suggestions for the development of future tests, and we hope that our findings also contribute to a broader discussion about the psychometric quality of exams.

Same, but different? Digital Transformation of Vocational Schools in Germany and Switzerland
Keywords: Digital Literacy and Learning, Quantitative Methods, School Leadership, Vocational Education and Apprenticeship Training
Presenting Author: Andreas Harder, University of Konstanz, Germany; **Co-Author:**Stephan Schumann, University of Constance, Germany; **Co-Author:**Serge

Imboden, HES-SO Valais-Wallis, Switzerland

Various theoretical approaches show the multifaceted character of digital transformation in the school context. The *Maturity Model for Educational Organizations* by Ifenthaler and Egloffstein (2020) delineates six content dimensions: Strategy and leadership, Equipment and technology, Organization, Employees, Culture, and Digital learning and teaching. In order to measure the digital status of these dimensions we conducted two (online) surveys in which n = 466 school management members from Switzerland and n = 117 respondents from Germany participated. Our research questions focus on the investigation of how the different aspects of digital transformation are perceived in both countries, whether differences can be identified between Switzerland and Germany and – since school management is considered to play a central role in shaping digital development processes – what importance is attached to the dimension of Strategy and leadership. While the development state of digital transformation is generally perceived as (rather) positive, the findings also show that there are country-specific differences regarding the perception of the various dimensions. While the *prioritization of digital transformation* is higher in Germany ($p = .002$; $d = 0.31$), *technological* ($p < .001$; $d = -0.65$) and *pedagogical* IT support ($p = .004$; $d = -0.29$) are perceived better in Switzerland. Furthermore, multivariate analyses show that the dimension of Strategy and leadership makes a substantial contribution to explaining the perceived digital status quo in both countries. On this basis, education policy measures such as the degree of autonomy of school management at the individual school level are discussed.

Session B 17

22 August 2023 15:00 - 16:30
UOM_R09
Single Paper
Higher Education, Motivational, Social and Affective Processes

Student Self-beliefs and Self-regulated Learning

Keywords: Emotion and Affect, Engagement, Higher Education, Learning Strategies, Meta-analysis, Motivation, Multicultural Education, Self-concept, Self-efficacy, Well-being
Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion
Chairperson: Dorit Bosse, University of Kassel, Institute of Educational Science, Germany

How do Variables Relate to K12-Students Self-Beliefs? A Second-Order Meta-Analysis
Keywords: Meta-analysis, Motivation, Self-concept, Self-efficacy
Presenting Author: Thorben Jansen, Leibniz-Institut für die Pädagogik der Naturwissenschaften und Mathematik, Germany; **Co-Author:**Jennifer Meyer, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**John Hattie, The University of Melbourne, Australia; **Co-Author:**Jens Möller, Institute of Psychology of Learning and Instruction, Kiel University, Germany

Positive self-beliefs (i.e. self-concept, self-efficacy, self-esteem) are known to be central to students' motivation and well-being. Importantly, research has considered variables that relate to self-beliefs, aiming to understand determinants that might be useful to transform self-beliefs in constructive ways. However, the comparative strength of the relations of self-beliefs with different variables is unclear but relevant in fostering positive self-beliefs effectively. In this second-order meta-analysis, we systematize the body of meta-analytic research from multiple research traditions investigating how variables relate to self-beliefs. We summarize research from 93 meta-analyses including 385 effect sizes and data from 8.5 million students. Further, we analyze the transparency and reproducibility of meta-analyses. To calculate mean effect sizes, we conducted a multi-level second-order meta-analysis, accounting for primary study overlap and for dependencies in the data. Results for student variables showed large effect sizes of associations of self-beliefs with achievement (d=0.52) and socioemotional variables (d=0.58), moderate associations with cognitive abilities (d=0.39), and small associations with background variables (d=0.20). Regarding interventions, the largest effect sizes were found for interventions targeting students' self-beliefs (d=0.48) and physical activity interventions (d=0.36). Interventions focusing to improve learning and teaching (d=0.18), socioemotional environment (d=0.19), and technology (d=0.13) showed smaller effect sizes. The methodological analyses showed that meta-analyses lack to publish their data and analyses code diminishing their transparency. Overall, by providing a comprehensive overview of empirical work in the field of self-beliefs we hope this systematic review can inspire fruitful discussions about understanding the development of positive self-beliefs and the role of education.

Influencing procrastination – results from a course
Keywords: Emotion and Affect, Higher Education, Learning Strategies, Well-being
Presenting Author: Henna Asikainen, University of Helsinki, Finland; **Co-Author:**Telle Hailikari, Häme University of Applied Sciences, Finland; **Co-Author:**Nina Katajavuori, University of Helsinki, Finland

The aim of our study is to explore the relationship between procrastination, organised studying and psychological flexibility as well as the changes in them during an ACT-based course which included also time management training. The aim is also to explore the effects of organised studying and psychological flexibility on procrastination. The study was made with an experimental design in an ACT-based wellbeing course which also included time management training. The participants were 109 students participating the course and 27 waiting list students. Our results show that organised studying, psychological flexibility and procrastination were related to each other, and all changed during the course. In addition, both organised studying and psychological flexibility had impact on the change in procrastination during the course. The results are further discussed in the conference.

"I have a sense of accomplishment": An Investigation into Chinese International Student Engagement
Keywords: Emotion and Affect, Engagement, Higher Education, Multicultural Education
Presenting Author:- Dangeni, Newcastle University, United Kingdom

Existing research on the growing number of Chinese international postgraduate students learning tends to take a narrow view of their experiences, mostly identifying challenges and barriers, yet lacking insights into their nuanced and multifaceted experiences, particularly regarding what they bring to this international learning experience and how they make sense of their experiences and interactions. This paper employs the meta-construct of student engagement to explore Chinese Master's students' experiences at two UK universities. The year-long collection of monthly audio diaries from 22 Chinese international students was analysed to seek an in-depth understanding of their everyday learning throughout an academic year. Thematic analysis was conducted guided by Kahu's conceptual framework of Student Engagement (2013), which is considered helpful and insightful to illuminate and indicate contextual trajectories, student engagement and success. One of the key findings, that this presentation will focus on is this cohort's reflected emotions attached to this international learning journey. While existing research on emotions and learning as well as international students' emotions were largely limited to negative emotions, e.g., 'stress', 'pressure' and 'confusion' (Cheng et al., 2019; Zheng, 2017), the findings from students' accounts help to identify a number of the positive emotions that they experienced and the reasons behind the emotional responses. This presentation will provide suggestions for key stakeholders involved in teaching and supporting international students, including HE institutions, programmes, staff members and international students as to how students can be best prepared for and supported in their international developmental trajectories.

Session B 18

22 August 2023 15:00 - 16:30
UOM_R02
Poster Presentation
Assessment and Evaluation, Instructional Design

Multimedia Learning

Keywords: Achievement, Assessment Methods, Cognitive Skills and Processes, Comprehension of Text and Graphics, Eye Tracking, Instructional Design,

Misconceptions, Multimedia Learning, Reading, Video-based Learning
Interest group: SIG 03 - Conceptual Change, SIG 06 - Instructional Design, SIG 27 - Online Measures of Learning Processes
Chairperson: Adriaan Vervoort, Belgium

Can Video Testimonials Augment the Refutation Effect in Climate Change Misconceptions?
Keywords: Misconceptions, Multimedia Learning, Reading, Video-based Learning
Presenting Author: Leen Catrysse, Open Universiteit, Department of Online Learning and Instruction, Belgium; **Co-Author:**Marcel 't Lam, Open Universiteit, Netherlands; **Co-Author:**Dorothy Duchatelet, Open Universiteit, Department of Online Learning and Instruction, Netherlands; **Co-Author:**Halszka Maria Jarodzka, Open Universiteit, Department of Online Learning and Instruction, Netherlands

Debunking misconceptions is crucial in our current society in which false information is spread very fast over the internet. Finding strategies to do this most effectively is very important, especially in case of controversial topics for which debunking interventions are not always successful or might even backfire. Refutation texts have been proven powerful in realising this, however research on multimodal refutation messages is rather scarce in which different rhetorical devices are combined (e.g., video and text). This research explores whether video testimonials can be used to augment the refutation effect when debunking commonly held misconceptions on climate change. Video testimonials have a power to personally affect somebody and effectively convey a message and can therefore be used to enhance refutation texts. However, also the testimony (being an expert or a peer) can make a difference in how the message is perceived. This study investigates whether a video testimonial can augment the refutation effect. A between-subjects design was used in which students either saw a testimonial by an expert, a peer or no testimonial before reading a refutation text on the greenhouse effect. Prior knowledge, post knowledge and delayed post knowledge was measured. Results demonstrate that students seeing an expert testimonial performed better on the immediate posttest than students seeing a peer testimonial. This study demonstrates the opportunities and risks of using multimodal refutation messages to debunk misconceptions.

Evidence-based design guidelines for multimedia testing
Keywords: Assessment Methods, Comprehension of Text and Graphics, Eye Tracking, Multimedia Learning
Presenting Author: Andrienne Kerckhoffs, Open Universiteit, Department of Online Learning and Instruction, Netherlands; **Co-Author:**José Janssen, Open University of the Netherlands, Netherlands; **Co-Author:**Ron Pat-El, Open University, Netherlands; **Co-Author:**Halszka Maria Jarodzka, Open Universiteit, Department of Online Learning and Instruction, Netherlands

Multimedia testing can increase test *authenticity* and *attractiveness,* but can also result in increased mental effort, longer processing times, and lower test performance. Surprisingly, no evidence-based guidelines exist on how to design multimedia assessments. While guidelines for designing multimedia *learning* provide a starting point, they are not one-to-one applicable to testing. The research presented in this poster contributes to the development of a Cognitive Theory of Multimedia Assessment by systematically studying how to design valid and reliable multimedia assessments in various domains within a higher education context. Following a design-based research approach, existing multimedia test items in the domain of Cultural Science will be redesigned in line with guidelines for multimedia learning. The effects of the redesign on item score, mental effort and response times will be established based on data (both logging and self-reported) of at least 400 students. Eye-tracking data will be collected for a subsample of about 30 students to enable a more detailed investigation of how students cognitively and perceptually process these test items. A similar experimental study will be carried out in another domain to explore external validity of the findings.

Investigating Content-Relevant Background Color as Retrieval Cue in Multimedia Learning
Keywords: Achievement, Cognitive Skills and Processes, Instructional Design, Multimedia Learning
Presenting Author: Felix Krieglstein, Chemnitz University of Technology, Germany; **Co-Author:**Felicia Meusel, Chemnitz University of Technology, Germany; **Co-Author:**Nadine Scheller, Chemnitz University of Technology, Germany

Previous studies on retrieval cues mainly neglected the effects of background color on learning performance, focusing on music and odor as retrieval cues as well as on the learning of simple word lists. The present study investigates the effects of retrieval cues on learning performance in a multimedia learning environment. As background color is a cue that is always present in such learning environments, we investigated if background color can serve as retrieval cue in multimedia learning. We further investigated whether a background color that relates to the content of the learning text increases the retrieval cue effect. Therefore, we divided a learning text into four parts and presented each part on a separate page with a different background color. Preliminary results from 36 participants indicate that retention and transfer performance are increased when the background color from the learning phase is presented again during the testing phase compared to when the colored background is present only during learning but not during the testing phase. Concerning cognitive load, a significant interaction was found. When background color was used both during learning and testing, related background colors resulted in lower cognitive load than unrelated background colors. It was not found
that related background colors compared to unrelated background colors enhanced the retrieval cue effect in terms of learning performance.

Session B 19

22 August 2023 15:00 - 16:30
UOM_R03
Poster Presentation
Higher Education, Motivational, Social and Affective Processes

Goal Orientations in Motivation and Emotion Research

Keywords: Achievement, Anxiety and Stress, Cooperative/Collaborative Learning, Emotion and Affect, Goal Orientations, Higher Education, Lifelong Learning, Motivation, Primary Education, Qualitative Methods, Science Education, Secondary Education, Self-efficacy, Self-regulated Learning and Behaviour, Social Interaction
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Mikko Tiilikainen, University of Turku, Finland

The Role of Emotions in Goal Revision and Performance: A Computational Modeling Approach
Keywords: Emotion and Affect, Goal Orientations, Motivation, Self-regulated Learning and Behaviour
Presenting Author: Wy Ming Lin, University of Tübingen, Germany; **Co-Author:**Lily FitzGibbon, University of Stirling, United Kingdom; **Co-Author:**Maria Theobold, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Jasmin Breitwieser, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Garvin Brod, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Kou Murayama, University of Tübingen, Germany; **Co-Author:**Michiko Sakaki, University of Tübingen, Germany

The effects of emotional experiences on self-regulation are important to consider as they may influence performance and motivation. However, studies on the effects of emotions on goal revision, an important component of self-regulation, have yielded inconsistent findings. Such inconsistent findings may be due to the complex dynamics across emotions, achievement performance, and goals. In our study, we propose to apply a computational modeling approach to empirical data collected in an education setting to ascertain the dynamic interactions across them. Computational modeling allows us to specify complex psychological phenomena as equations and to estimate posterior distributions, or a highly probable approximation, of parameters of interest. We developed a model to separately estimate the effects of emotions on goal revision and performance revision, as well as the effects of goal/performance on emotions. We first applied the model to data from a simple math task. Results showed that positive emotions led to higher goals set and negative emotions to lower goals. The model was then applied to data from German medical students who studied for up to 40 days towards a high stakes exam. Results showed that the model was also able to capture the effects of emotions on goal revision in such everyday learning settings. The results from this study will help us begin to ascertain the effects of emotions on goal revision in learning contexts and to spark discussion for the use of computational modeling in education research.

Effects of Performance Goals and Self-Efficacy on Cheating in an Academic Test
Keywords: Achievement, Goal Orientations, Motivation, Self-efficacy
Presenting Author: Melissa Özsoy, University of Augsburg, Germany; **Co-Author:**Tanja Fritz, Augsburg University, Germany; **Co-Author:**Martin Daumiller, Augsburg University, Germany

Previous research revealed inconsistent results on the effects of performance goals on academic cheating, possibly due to unexplored moderators. Therefore, we investigated whether task- and cheating-related self-efficacy influenced the effect of performance goals on cheating in a test. We conducted an experiment with performance goal induction with a sample of $N = 238$ German University students (66.1 % female). Performance goals and task-related self-efficacy were assessed within the experiment and cheating-related self-efficacy with additional interviews. Cheating was assessed both by integrated unsolvable tasks and by observation.Significant direct effects of the performance goal induction, cheating- and task-related self-efficacy as well as interaction effects of cheating-related self-efficacy were found depending on how cheating was measured. Future research could especially focus on the role of cheating-related self-efficacy.

Intentions to study secondary science: A latent profile analysis from a multiple goals perspective
Keywords: Goal Orientations, Motivation, Science Education, Secondary Education
Presenting Author: Nathan Berger, Western Sydney University, Australia; **Co-Author:**Erin Mackenzie, Western Sydney University, Australia; **Co-Author:**Kathryn Holmes, Western Sydney University, Australia; **Co-Author:**Jennifer Archer, The University of Newcastle, Australia

Achievement goals describe patterns of mastery and performance orientation which impact school achievement and motivation. While person-centred analyses have become more prevalent in educational research, few studies have applied this technique to adolescents' science achievement goals and intentions to take science in secondary school. In this Australian study, 461 students completed a questionnaire about achievement goals in science (mastery, performance approach, and performance avoid), and intentions to study secondary science subjects. A latent profile analysis of achievement goals revealed five latent profiles. Reflecting the multiple goals perspective, each latent profile differed on each of the achievement goals. One profile was characterised. Within this profile, girls were overrepresented compared to boys. Two profiles had medium achievement goals. Two profiles had high achievement goals, which were differentiated by performance avoid goals. One of these profiles had high performance avoid goals, while the other had performance avoid goals similar to the lower achievement goal profile. Prior achievement in science was associated with latent profile membership. Students in the lower goal profiles had lower prior achievement compared to students in the higher goal profiles. There was also an association with intentions to study biology, chemistry, and physics. Students in the two high goal profiles were more likely to indicate an intention to take those subjects compared to students in the lower goal profiles. The findings suggest that fostering adaptive science achievement goals may help address concerns about declining participation in biology, chemistry, and physics in secondary school.

Motivation During the PhD: Development of Achievement Goals Depending on Contextual Factors
Keywords: Goal Orientations, Higher Education, Lifelong Learning, Motivation
Presenting Author: Raven Rinas, Augsburg University, Germany; **Co-Author:**Martin Daumiller, University of Augsburg, Germany; **Co-Author:**Stefan Janke, University of Mannheim, Germany; **Co-Author:**Oliver Dickhaeuser, University of Mannheim, Germany; **Co-Author:**Markus Dresel, University of Augsburg, Germany

Researchers generate knowledge for society. However, they themselves can also be viewed as learners who acquire academic working skills, especially during early career stages. Educational psychologists have highlighted the role of different achievement goals for cognitions and behaviors in achievement contexts. They are often considered as relatively stable personality factors, however, to understand the variability of achievement goals more thoroughly, consideration of temporal variability and context specificity is necessary. Academia as a workplace is characterized by highly formalized vocational transitions as well as strong interindividual differences in working conditions, which should impact achievement goals over time. We tracked the course of mastery and performance goals in 137 PhD students (79 females, age: $M = 29.4$, $SD = 5.0$ years) at 4 time points over a period of two years and linked it to contextual factors such as rewards and obligations. As hypothesized, there was a significant decline in mastery goals ($t = -2.12$, $p = .03$). Performance goals showed no global trends but high variance in interindividual trajectories ($Var = 1.3\text{-}1.8$, p

Thought patterns of students with a positive or negative self-evaluation bias of competence
Keywords: Anxiety and Stress, Goal Orientations, Primary Education, Qualitative Methods
Presenting Author: Anne-Laure de Place, Université Paris 8 - Vincennes - Saint Denis, France; **Co-Author:**Laurent Lima, Université Grenoble Alpes, France; **Co-Author:**Fanny Verkampt, Université Toulouse - Jean Jaurès, France; **Co-Author:**Pascal Pansu, Université Grenoble Alpes, France

This paper aims to explore the antecedents of self-evaluation biases of school competence by collecting autobiographical data from students who exhibit a stable positive or negative bias of their competence in a specific school subject (here, their first language skills). To identify the thought patterns of students who chronically under- or over-estimate their language competence, we used an interview procedure inspired by the cognitive interview for children. 33 students in their last year of primary school (17 with a positive bias of language competence, 16 with a negative bias) were asked to recall a time when they failed a language evaluation. Of those, 19 were interviewed a second time to recall a successful experience. A lexical analysis of their comments revealed that the thought patterns of both positively and negatively biased students were similar when recalling a success, with a discourse articulated around two poles, one referring to the characteristics of the evaluation and the other to its execution. In contrast, when recalling a failure, the situation described by negatively biased students was much more imbued with stress, without the distinction between the two poles described above, whereas positively biased students displayed a thought process similar to the one they had when speaking about a success. We suggest that this singular emphasis on fear of evaluation among negatively biased students denotes a focus on performance-avoidance goals, the deleterious effects of which on learning and performance are well-known, while positively biased students manage to mobilize both performance and mastery goals.

Conceptualizing Prosocial Motivation: Contributing to benefit others in Collaborative Group Contexts
Keywords: Cooperative/Collaborative Learning, Goal Orientations, Motivation, Social Interaction
Presenting Author: Toni Rogat, Purdue University, United States

This poster presentation aims to synthesize relevant literature and theorize prosocial forms of motivation. The aim is to extend our conceptualization of motivation constructs to better account for the motivational experience of learners in collaborative group and interpersonal contexts. The social dynamics of learning are more prominent in small groups, with potentially important implications for motivational processes. In particular, this presentation presents prosocial motivation to include a social instrumental or altruistic direction for the following constructs: achievement goals, value beliefs, competence, and situational interest. Ultimately, prosocial forms of motivation have potential for expanding access or broadening pathways to motivation by supporting a fuller range of the motivational experience beyond exclusively self-ends.

Session B 20

22 August 2023 15:00 - 16:30
UOM_R01
Poster Presentation
Educational Policy and Systems, Higher Education, Motivational, Social and Affective Processes

Well-being and Resilience

Keywords: Achievement, Anxiety and Stress, Developmental Processes, Early Childhood Education, Emotion and Affect, Health-care Education, Higher Education, Multimedia Learning, Quantitative Methods, Resilience, School Effectiveness, Secondary Education, Social Media, Well-being
Interest group: SIG 04 - Higher Education, SIG 05 - Learning and Development in Early Childhood, SIG 08 - Motivation and Emotion, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Panayiota Metallidou, Aristotle University of Thessaloniki, Greece

Looking for talent: discover and stimulate talent-awareness in preschool with a digital portfolio
Keywords: Early Childhood Education, Multimedia Learning, Resilience, Well-being
Presenting Author: Saar Steverlinck, Hogeschool PXL, Belgium; **Co-Author:**Hanne Rosius, Hogeschool PXL, Belgium; **Co-Author:**Dorien Jansen, Hogeschool PXL, Belgium

XPO 2.5 is a method for achieving talent-centred education in preschool. The project is designed with a clear vision, based on the growth mindset (Dweck, 2018), self-determination theory (Deci & Ryan, 1999) and talent (Dewulf, 2018 & 2020; Buckingham & Vosburgh, 2001). Based on our theoretical framework and the results from focus groups, a number of valuable materials were created according to the phases of the model of Educational Design Research . First, we developed a set of didactic materials (posters, storyboards, stories, drawing boards) to concretize and give language to the concept of talent at the preschool level. Second, we constructed a triptych of apps and an online tool for the pre-schooler, the teacher and parents to record and show talents of pre-schoolers to the world. Thirdly, a practical guide with concrete tips and good practices was written to inspire teachers to get started in their classrooms. To support the teacher a set of digital micro lessons were created to introduce the theoretical framework, the materials, and apps/tools. XPO 2.5 stands out as a project by its concrete and practical materials that can be used immediately in the classroom.

Measuring School's Contribution to Students' Mental Health: Validation of a New Scale
Keywords: Emotion and Affect, Health-care Education, Secondary Education, Well-being
Presenting Author: Christian Brandmo, University of Oslo, Norway; **Co-Author:**Hanne Nissen Bjørnsen, Norwegian University of Science and Technology (NTNU), Norway; **Co-Author:**Gunnar Bjørnebekk, Department of Special Needs Education, Norway

Over the last decade, there has been a growing interest in mental health literacy (MHL) in health promotion, largely motivated by increased awareness of MHL as a modifiable determinant of mental health. Accordingly, MHL has been associated with the health-promoting school approach emerging over the last 20 years. To succeed in promoting MHL, it is important to evaluate working strategies and interventions to address it using validated instruments. The current study describes the revision and psychometric testing of a modified version of the 10-item adolescents' positive MHL measure, the MHPK-10, the only identified instrument measuring adolescents' positive MHL. The MHPK-10 was adjusted to address the previously documented ceiling effects. It was further optimized for use in schools by reworking it to measure learning rather than self-reported knowledge, becoming the new nine-item Mental Health Learning Scale (MHLS-9). The MHLS-9 was tested on a national sample of N = 2,012 Norwegian 9th graders. Data were analyzed by confirmatory factor analysis (CFA) and tests of reliability and validity. The revised CFA model for the MHLS-9 showed an improved fit over the original CFA model for the MHPK-10. The MHLS-9s' CFA model revealed excellent factor determinacy (.95) and scale reliability (ω = .91). Thus, the MHLS-9 is an improved measure for the positive component of MHL for use in school settings, enabling researchers and practitioners to evaluate and target positive MHL interventions in schools using a short, reliable, and valid measure for adolescents' learning about the factors promoting good mental health.

Testing the effectiveness of a physical activity program on adolescent resiliency
Keywords: Developmental Processes, Emotion and Affect, Quantitative Methods, Well-being
Presenting Author:yuhan hu, Eramus University Rotterdam, Netherlands; **Co-Author:**Brian Godor, Avans University of Applied Sciences, Netherlands; **Co-Author:**Guus Smeets, Eramus University Rotterdam, Netherlands; **Co-Author:**Ruth Van der Hallen, Eramus University Rotterdam, Netherlands

Since the world is experiencing unprecedented changes with ever-accelerating globalization and technological advancements, fostering social and emotional development (SED) has become a good way to help adolescents confront the uncertain world. The present study evaluated the effectiveness of an after-school physical activity intervention targeting SED in promoting resilience in adolescents. A total of 137 adolescents from inner-city schools participated in a 20-week intervention (male: 80, female: 53; M_{age} = 11.20, SD = 1.04). Results indicated that this intervention significantly improved overall resilience ($F(1,32) = 11.86, p < .01$), in particular sense of relatedness and emotional reactivity ($F(1,32) = 7.08, p < .05$; $F(1,32) = 5.90, p < .05$), among adolescent with low resilience at T0. This study provides evidence of the effectiveness of physical activity interventions on inner-city adolescents' well-being, enriching SED programs that serve at-risk adolescents.

Meet Them Where They Are: An Investigation of Social Media and Stress in College Students
Keywords: Anxiety and Stress, Higher Education, Social Media, Well-being
Presenting Author: Suzanne Lindt, Midwestern State University, United States; **Presenting Author:**Stacia Miller, Midwstern State University, United States; **Presenting Author:**Christina Janise McIntyre, Midwestern State University, United States

Recent research purports that the prevalence of social media use may be to blame for elevated rates of anxiety and stress in college students (Sahin Baltaci, 2021). The purpose of this pilot study was to investigate whether learning about the harmful effects of social media could impact college students' behaviors and mental health. Participants completed a perceived stress survey, readiness to change assessment, and a social media usage report. Participants in the treatment group will be given articles about the benefits of reducing social media use and will provide a brief summary of the article. After comparing baseline data to previous research, students in our sample may have higher than average stress for others their age. Furthermore, results on readiness to change suggest that many students in our sample do not feel that they need to change their social media habits. Although preliminary results show that students may not be ready for change, their levels of stress suggest that intervention is critical. In the classroom, students with greater anxiety and depression may have lower academic outcomes and be at risk for successfully completing their college degrees.

What works best? 3 years of designing & piloting a stress management and resilience intervention
Keywords: Anxiety and Stress, Higher Education, Resilience, Well-being
Presenting Author: Natalie Peters, TU Dresden, Faculty of Business and Economics, Chair of Business Education and Management Training, Germany

Living in a rapidly changing world has taken its toll on students in higher education. Mental health issues, such as symptoms of depression or burnout, insomnia, eating disorders and others are on the rise, as various studies in the last years have found (e. g. Auerbach et al., 2016). This development was recently accelerated through the worldwide COVID-19 pandemic (e. g. Chen & Lucock, 2022). Adding to that, the recent and precarious situation of warfare in Europe marks the particular circumstances of uncertain times and an uncertain future. Hence, it is more important than ever, to not only form young minds in higher education, but to support them in preparing for and coping with adversity and uncertainty. One way to strengthen students' mental health is through promoting individual resilience and stress management. This is often achieved through training interventions that target the adaption or change of behavior towards healthy and adaptive coping with stressors and adverse situations. These interventions have shown to be effective in numerous studies before (e. g. Conley, Durlak & Kirsch, 2015). Therefore, a pilot intervention for students in higher education was implemented into the curricula of Master students at a large German university. In total, 164 students took part in the ongoing study. After three years of differing designs and their implementation, the intended goal for this proposal is to give an overview of the different designs of the pilot as well as cumulative results and implications for future research and interventions.

Relationships between School-related outcomes and general variables: A tentative comprehensive model
Keywords: Achievement, Anxiety and Stress, School Effectiveness, Well-being
Presenting Author: Clément PERRIN, Université Grenoble Alpes, France; **Co-Author:**Pascal Bressoux, Université Grenoble Alpes, France; **Co-Author:**Pierre De Oliveira, Laboratoire Psy-DREPI, Université de Bourgogne-Franche-Comté, France

School climate has been extensively studied over the past decades. Despite a consensus on its impact on several students' outcomes (achievement, school satisfaction, stress, and perceived social support), no comprehensive model is clearly accepted in the research community. This study proposes a model of school climate that describes its dimensions and relationships with both students' school-related outcomes (school satisfaction, achievement, stress, perceived social support) and more general variables such as sleep, mental health, and self-esteem. Using structural equation modelling, we show that school climate as well as the general variables are related to students' school-related outcomes. There is also a direct link between school climate and general variables. To the best of our knowledge, this work is the first one that proposes a comprehensive model of the relationships between school climate, school-related outcomes and

general variables.

Session B 21

22 August 2023 15:00 - 16:30
UOM_R04
Poster Presentation
Assessment and Evaluation, Cognitive Science, Learning and Special Education

Achievement and Mathematics in Educational Settings

Keywords: Achievement, Classroom Assessment, Cognitive Development, Cognitive Skills and Processes, Early Childhood Education, Educational Neuroscience, Large-scale Assessment, Learning and Developmental Difficulties, Mathematics/Numeracy, Metacognition
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 16 - Metacognition and Self-Regulated Learning, SIG 22 - Neuroscience and Education
Chairperson: Sara Caviola, University of Padova, Italy

Can early childhood education in Kosovo contribute to the reduction of educational inequality?
Keywords: Achievement, Early Childhood Education, Large-scale Assessment, Mathematics/Numeracy
Presenting Author: Saranda Shabanhaxhaj, University of Graz, Institute of Education Research and Teacher Education, Austria; **Co-Author:**Heike Wendt, University of Graz, Austria

The relationship between family characteristics, early childhood education and educational achievement is quite well researched for western industrialized countries. The generalizability of theories and findings for post-war contexts and newly established countries, such as Kosovo, remains unclear. Apart from the TIMSS international report of 2019 (Mullis et al., 2020), documenting significant higher achievement results in mathematics, for those children who attended an ECE institution and had early numeracy activities at home, little to nothing is known about ECE in Kosovo. The paper aims to contribute to filling this research gap by analyzing attendance patters and relationships between ECE attendance, family background, early childhood activities in the family and mathematical achievement for children in Grade 4 using TIMSS 2019 data for Kosovo. We find substantial disparities in ECE attendance by economic and cultural indicators as well as parental aspirations, with ratio differences up to 50%. With regard to achievement differences in mathematics, attenders significantly outperform non-attenders by 24 points, with no differences between attenders and long-attenders. Attendance in ECE remains a significant predictor of math achievement, when controlling for home educational resources, home learning support and educational aspiration. We conclude that ECE may have a compensatory potential for socially disadvantaged children in Kosovo.

Electrophysiological correlates of processing numerical order and their association to arithmetic
Keywords: Achievement, Cognitive Skills and Processes, Educational Neuroscience, Mathematics/Numeracy
Presenting Author: Stephan Vogel, University of Graz, Austria; **Co-Author:**Clemens Brunner, University of Graz, Austria; **Co-Author:**Roland Grabner, University of Graz, Austria

Numerical order, i.e., the knowledge about the relative position of numerals, is a significant predictor of arithmetic abilities. Despite its functional relevance, little is known about the neurocognitive mechanisms that support ordinal knowledge and their association with arithmetic. A central characteristic of ordinal processing is a significant decrease in reaction times and/or error rates when individuals verify the correctness of adjacent ordered numbers (e.g., 2-3-4) in contrast to non-adjacent (e.g., 2-4-6). Neuroscientific studies using electroencephalography (EEG) have indicated a significant association between ordinal processing and event-related potentials (ERP) at around 210-240ms and 310-510ms on parietal and frontal electrodes. The neurocognitive functions of these spatio-temporal patterns and their role for arithmetic are, however, unknown.To further investigate the brain characteristics of ordinal processing and their association with arithmetic, we collected behavioral and 64-channel EEG data from adults who performed a numerical ordinal verification task, i.e., they indicated whether a sequence of numerals was in-order (e.g., 2-3-4) or not (e.g., 2-4-3). Arithmetic abilities were assessed with a timed paper-pencil test measuring arithmetic fluency. Our analyses indicate more accurate judgements for adjacent numbers compared to non-adjacent ordered numbers. This behavioral distance effect is mirrored by a modulation in ERPs at parieto-occipital electrodes at around 210-240ms. Furthermore, we identified a significant brain-behavioural correlation between the ERP signal for in-order compared to non-order trials at 500-750ms and arithmetic fluency at the midline central (C). Results of this work provide crucial insights into the neurocognitive mechanisms of order processing and their functional role for arithmetic.

Reading Metacognition and Mathematical Literacy: A Cross-Country Comparison of Taiwan and Germany
Keywords: Achievement, Large-scale Assessment, Mathematics/Numeracy, Metacognition
Presenting Author: Su-Wei Lin, National University of Tainan, Taiwan; **Co-Author:**Anselm Strohmaier, Technical University of Munich, Germany; **Co-Author:**Pei-Ming Chiang, National University of Tainan, Taiwan

The purpose of this study was to explore profiles of knowledge about reading metacognition for Taiwanese and German students, and to compare the relationships of these derived profiles and mathematical literacy for these two countries. This study adopted the multigroup latent profile analysis (LPA) and hierarchical linear model (HLM) to analyse the Programme for International Student Assessment (PISA) 2018 Taiwanese and German data. The result showed that four profiles of reading metacognition were the optimal model in both countries, but the distribution of students differed. After controlling for gender, as well as the economic, social and culture status (ESCS) of students and schools, the associations of reading metacognition profiles and mathematical literacy were similar for both countries. This indicated that metacognition is relevant for solving mathematical problems in both countries, but is not able to explain country differences in achievement.

Numerical Competencies in Preschoolers with Language Difficulties
Keywords: Achievement, Cognitive Development, Learning and Developmental Difficulties, Mathematics/Numeracy
Presenting Author: Kirsten Schuchardt, University Hildesheim, Germany; **Co-Author:**Claudia Maehler, University of Hildesheim, Germany

School children with specific language disorders (SLI) often experience massive learning difficulties concerning both literacy and numeracy. The study investigates whether preschool children with SLI already show abnormalities in basic numerical skills and whether these are accompanied by impairments in the visuo-spatial sketchpad of working memory. In a three-group design, the group of SLI-children (n=25) is contrasted with two control groups: (1) children of the same chronological age without signs of language deficits (CA, n=25), and (2) a group of children on the same level of language development as the SLI-group, i.e. of the same language maturity (LA, n=25). Results show that counting abilities and performance in early numerical competence are comparable to those of the younger control group, thus showing a developmental delay corresponding to the delay in the childrens' language skills. In contrast, performance in numeral knowledge and comprehension of quantity lies between the two control groups. Numerical developmental abnormalities are not associated with a reduced capacity of the visuo-spatial sketchpad. Our results support the language deficit hypothesis, according to which developmental language abnormalities are considered a barrier to the development of age-appropriate numerical competencies.

Mapping across different types of representations in preschool
Keywords: Achievement, Cognitive Development, Early Childhood Education, Mathematics/Numeracy
Presenting Author: Josetxu Orrantia, University of Salamanca, Spain; **Co-Author:**Laura Matilla, Univeresity of Salamanca, Spain; **Co-Author:**Rosario Sánchez, University of Salamanca, Spain; **Co-Author:**Verónica Carretón Jareño, University of Salamanca, Spain; **Co-Author:**David Munez, National Institute of Education / Nanyang Technological University, Singapore

Learning how to map across symbolic and non-symbolic representations of number is quite challenging for young children. Prior research has largely focused on mapping between verbal number words, written digits, and non-symbolic quantities such as dot arrays. However, it is also possible representing numbers with finger configurations. Indeed, it has been suggested that finger configurations are processed in the same way as other symbolic representations. In the

present study, 3- and 4-year-old children (N = 215) were presented with tasks assessing the mapping between number words, Arabic digits, dice patterns, and finger configurations for the quantities one to seven. Results from a mixed model revealed that the probability of mapping efficiently across different numerical representations differs across types of mapping. Globally, mappings involving quantity were more difficult than mappings between symbolic representations, including finger configurations. In addition, performance on a symbolic comparison task was predicted by the mappings between fingers and other number representations, even when the effects of age, memory, cardinal number knowledge and mappings between number words, digits, and quantities were controlled for. These findings provide further support to the symbolic properties of finger configurations and the role that these configurations may have for the acquisition of basic numerical abilities at early stages in development. Our findings support educational practices encouraging the representational role of finger patterns as a potential bridge between number words and digits and the quantities they represent.

Finger numeral recognition predicts arithmetic performance in primary school
Keywords: Achievement, Classroom Assessment, Cognitive Development, Mathematics/Numeracy
Presenting Author: Josetxu Orrantia, University of Salamanca, Spain; **Co-Author:**Rosario Sánchez, University of Salamanca, Spain; **Co-Author:**Laura Matilla, Univeresity of Salamanca, Spain; **Co-Author:**Verónica Carretón Jareño, University of Salamanca, Spain; **Co-Author:**David Munez, National Institute of Education / Nanyang Technological University, Singapore

Identifying the precursors of arithmetic performance enables us to ensure that children receive adequate mathematical instruction and can manage numbers and calculations with ease. Prior research has focused on the relationship between symbolic and non-symbolic representations and arithmetic. But little is known about the influence of finger processing in arithmetic. In this sense, the vast majority of research has concentrated on the influence of finger gnosis in number processing and arithmetic skills. Nevertheless, few studies have investigated whether finger numeral representations at the start of formal schooling can predict subsequent development in single-digit arithmetic, specifically, fact retrieval in sums. For this purpose, in the present study, 110 elementary school students were assessed in two different moments (grade 1 and grade 2). At the middle of first grade, we administered the measure of intellectual ability as well as numerical processing measures (rapid digit naming, symbolic numerical magnitude comparison, counting and finger numeral representations recognition). Our longitudinal data reveal that children's accuracy recognizing finger numeral representations in first grade was predictively related to their future competence retrieving facts from memory in single-digit arithmetic. This association remained even when age in months, intellectual ability, rapid digit naming, and the numerical processing measures are additionally controlled for. Our findings suggest that finger numeral representations recognition skills at early stages of development precede children's arithmetic performance and fact retrieval when solving single-digit sums problems.

Session B 22

22 August 2023 15:00 - 16:30
UOM_GYM
Roundtable
Assessment and Evaluation

Environmental Education

Keywords: Competencies, Emotion and Affect, Environmental Education, Large-scale Assessment, Science Education, Secondary Education, Sustainable Development
Interest group: SIG 01 - Assessment and Evaluation
Chairperson: Jordi Casteleyn, Antwerp University, Belgium

Words Matter: Public Perceptions of Climate Change Terminology
Keywords: Emotion and Affect, Environmental Education, Science Education, Sustainable Development
Presenting Author: Laurel Kruke, University of Southern California, United States; **Presenting Author:**Gale Sinatra, University of Southern California, United States; **Co-Author:**Wandi Bruine de Bruin, University of Southern California, United States; **Co-Author:**Norbert Schwarz, University of Southern California, United States

“Global warming” and “climate change” have historically been used interchangeably to describe the same phenomenon, with studies showing that people may interpret their meanings differently and express varying levels of concern or willingness to act based on personal experiences and belief systems (Schuldt et al., 2011; Soutter & Mottus, 2020; Weber & Stern, 2011; Whitmarsh, 2009). Bruine de Bruin and colleagues (2021) also found that people can misinterpret common climate change terms, which causes confusion and can contribute to inaction. This roundtable will present findings from a follow-up study to Bruine de Bruin et al. (2021), conducted to test whether more recently introduced terminology such as “climate crisis,” “climate emergency,” and “climate justice” incites more concern and urgency to act to reduce the impacts of climate change. The study will use a nationally representative sample of 6,000 participants from the USA using the Understanding America Study participant pool. Respondents will be randomly assigned to one of the five terms of interest (“global warming,” “climate change,” “climate crisis,” “climate emergency,” and “climate justice”) and asked to answer survey questions related to their concern and willingness to take climate action. The findings will be analyzed to understand whether these newer, more urgent terms are effectively increasing concern and a willingness to act, and if so, which term is more effective at spurring action. Uncovering the public perceptions of these terms can help climate communicators, including educators, utilize language that will engage students with climate solutions.

There is no planet B, so what now? Measuring climate literacy in teenagers
Keywords: Competencies, Environmental Education, Large-scale Assessment, Secondary Education
Presenting Author: Monika Martin, University of Education Freiburg, Germany; **Co-Author:**Magdalena Stadler, University of Education Freiburg, Germany; **Co-Author:**Josef Künsting, University of Education Freiburg, Germany; **Co-Author:**Werner Rieß, PH Freiburg, Germany

Climate change is one of the most complex and urgent challenges we face. With a lack of knowledge about the causes, impacts and solutions to climate change being one of the greatest barriers for individuals to engage in climate action, education systems form one of the *social tipping elements* crucial in fighting climate change. Thus, there is a need for a valid and reliable instrument to monitor climate change education and to derive approaches for further measures. In the present project, we are developing a competence test for measuring climate literacy in 15-year-olds. In a first step, we developed a competence model adapted from the framework for scientific literacy in PISA assessments. Based on four competence aspects (e.g., knowledge application) and four content domains (e.g., mitigation and adaptation strategies), we developed a pool of test items. While climate change education in schools currently mostly focuses on the scientific basics (e.g., the greenhouse gas effect), the content domains covered in the climate literacy test explicitly integrate socio-scientific, economic, political, and ethical aspects. Currently, we are piloting our test items with a sample of 500 students. After data collection, we will determine item difficulties using Rasch analysis and modify the test items. In the roundtable contribution we want to discuss ideas to further develop the test instrument as well as possibilities and limitations for its use.

Session B 23

22 August 2023 15:00 - 16:30
UOM_A10
Workshop
Instructional Design

Contributing to the innovative culture: Creating a progression-game gamified instructional design

Keywords: Engagement, Game-based Learning, Higher Education, Instructional Design
Interest group: SIG 06 - Instructional Design

The present paper proposes an instructional design framework (IDF) workshop, during which the participants will have the opportunity to acquaint themselves with the use of an award-winning IDF and create an own teaching/learning route. The ID is rooted in Comenius' core didactic principles, the principles of gamified teaching, and the principle of sustainability. The IDF was inspired by orienteering, and it is conceived as an open framework, which makes possible the creation of gamified teaching and learning experiences in an array of subject areas. In 2022, the IDF has won both an international first prize and a national first prize for the best student-centered teaching practice in tertiary education. The workshop will contain a brief presentation of the IDF followed by a hands-on activity. The participants are welcome to bring in their own study content and employ the IDF to create an own teaching route using the most basic digital tools such as Microsoft Documents, Microsoft Excel, or EdForm. The participants are also invited to bring in their laptops as the digital tools to be employed work better on computers than on tablets. The main learning outcome for the participants is to become able to adopt game design-elements to the content of their choice to create gamified learning experiences.

Contributing to the innovative culture: Creating a progression-game gamified instructional design
Presenting Author: Emese Boksay-Pap, Pázmány Péter Catholic University, The Institute of International Studies & Political Science, Hungary

The present paper proposes an instructional design framework (IDF) workshop, during which the participants will have the opportunity to acquaint themselves with the use of an award-winning IDF and create an own teaching/learning route. The ID is rooted in Comenius' core didactic principles, the principles of gamified teaching, and the principle of sustainability. The IDF was inspired by orienteering, and it is conceived as an open framework, which makes possible the creation of gamified teaching and learning experiences in an array of subject areas. In 2022, the IDF has won both an international first prize and a national first prize for the best student-centered teaching practice in tertiary education. The workshop will contain a brief presentation of the IDF followed by a hands-on activity. The participants are welcome to bring in their own study content and employ the IDF to create an own teaching route using the most basic digital tools such as Microsoft Documents, Microsoft Excel, or EdForm. The participants are also invited to bring in their laptops as the digital tools to be employed work better on computers than on tablets. The main learning outcome for the participants is to become able to adopt game design-elements to the content of their choice to create gamified learning experiences.

Session B 24

22 August 2023 15:00 - 16:30
UOM_R05
Workshop
Teaching and Teacher Education

Creating opportunities for self-regulated learning:setting up participatory design-research studies.

Keywords: Curriculum Development, Higher Education, Self-regulated Learning and Behaviour, Teacher Professional Development
Interest group: SIG 04 - Higher Education

Students in Higher Education are expected to behave as active self-regulated learners. However, many do not meet these expectations. Although most teachers consider themselves responsible for the development of their students' self-regulated learning skills, few teachers find themselves sufficiently capable. An important factor which obstructs students' development of self-regulated learning skills is the fact that the curriculum is often strongly teacher controlled and therefore do not avail development. Moreover, research shows that teachers lack sufficient knowledge of effective interventions to develop self-regulated learning skills. In this workshop we introduce a conceptual model for participatory design-research together with teachers to develop evidence-informed practices that support students' SRL- skills. Participants will be invited and activated to explore how to set-up participatory research-design studies which will yield ecological valid solutions to the teachers' dilemma.

Creating opportunities for self-regulated learning:setting up participatory design-research studies.
Presenting Author:H.J.M. Stokhof, HAN University of Applied Sciences, Netherlands; **Presenting Author:**Jeroen van der Linden, HAN University of Applied Sciences / Maastricht University, Netherlands

Students in Higher Education are expected to behave as active self-regulated learners. However, many do not meet these expectations. Although most teachers consider themselves responsible for the development of their students' self-regulated learning skills, few teachers find themselves sufficiently capable. An important factor which obstructs students' development of self-regulated learning skills is the fact that the curriculum is often strongly teacher controlled and therefore do not avail development. Moreover, research shows that teachers lack sufficient knowledge of effective interventions to develop self-regulated learning skills. In this workshop we introduce a conceptual model for participatory design-research together with teachers to develop evidence-informed practices that support students' SRL- skills. Participants will be invited and activated to explore how to set-up participatory research-design studies which will yield ecological valid solutions to the teachers' dilemma.

Session B 25

22 August 2023 15:00 - 16:30
UOM_A11
ICT Demonstration

Closing the Feedback Loop - A Moodle Plugin for (Semi-)automated Feedback

Keywords: Assessment Methods, Feedback, Learning Analytics, Tool Development
Interest group: SIG 04 - Higher Education

Please bring your own device if you are attending this ICT demonstration.Feedback is a key element of successful classroom practice that improves student learning outcomes. However, feedback is still a rarely used instrument in higher education, especially in large courses. As the COVID-19 pandemic forced all education providers to move their complete teaching concepts online, the distance between teachers and students increased highlighting the importance of feedback. At the same time, online environments allow the collection of trace data as students interact with the learning environment. Such data can be leveraged using learning analytics methods to design feedback interventions. In this ICT demonstration we introduce [blinded_for_review], a Moodle plugin which helps teachers provide written feedback in large courses. This tool also prompts students to reflect on the feedback they received and allows teachers to explore if such feedback helps students to understand their learning behavior and improve their learning performance. Our tool is intended to work as an educational intervention and an instrument of dialogue between teachers and students and thus closing the feedback loop. At the same time, the plugin can be a relevant research tool as it allows us to better understand how students perceive the feedback and self-reflect. During the demonstration, participants will have access to a Moodle installation with various learning activities and will be able to configure and examine the feedback plugin.

Closing the Feedback Loop - A Moodle Plugin for (Semi-)automated Feedback
Presenting Author: Ioana Jivet, Goethe University Frankfurt & DIPF, Germany; **Co-Author:**Tornike Giorgashvili, Goethe-Universität Frankfurt am Main, Germany; **Co-Author:**Hendrik Drachsler, Goethe University Frankfurt, Germany

Please bring your own device if you are attending this ICT demonstration.Feedback is a key element of successful classroom practice that improves student learning outcomes. However, feedback is still a rarely used instrument in higher education, especially in large courses. As the COVID-19 pandemic forced all education providers to move their complete teaching concepts online, the distance between teachers and students increased highlighting the importance of feedback. At the same time, online environments allow the collection of trace data as students interact with the learning environment. Such data can be leveraged using learning analytics methods to design feedback interventions. In this ICT demonstration we introduce [blinded_for_review], a Moodle plugin which helps teachers provide written feedback in large courses. This tool also prompts students to reflect on the feedback they received and allows teachers to explore if such feedback helps students to understand their learning behavior and improve their learning performance. Our tool is intended to work as an

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Session B 26

22 August 2023 15:00 - 16:30
UOM_A07
ICT Demonstration
Learning and Instructional Technology

Microsofts' Immersive Reader as translanguage-enabling technology in second language acquisition.

Keywords: Foreign and Second Language Acquisition, Immersive Technologies for Learning, Inclusive Education, Teaching/Instructional Strategies
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Please bring your own device if you are attending this ICT demonstration.

Can Microsoft's Immersive Reader (IR) promote educational equity and the increased inclusion of second language (L2) learners? L2 learners are often grouped together in complex multilingual classrooms, where their lack of proficiency in the language of instruction (L2) constitutes a stark contrast to their level of proficiency in their first languages (L1). Translanguaging research positions students' pre-existing knowledge as a valued resource, indicating how a learner's L1 can scaffold the acquisition of L2. Ideally, L2 learners would have language instructor(s) proficient in all the respective L1s, but this is improbable in any classroom. There is, however, technology which might facilitate extensive L1 support. We aim to present the Immersive Reader (IR) as translanguage-enabling technology with the potential to promote language learner's multilingual competence and facilitate L2 acquisition. The IR is a free built-in tool in Office365, making it highly and easily accessible to many. In the ICT demonstration we present and discuss its features, which can be combined to support the individual's language learning. This includes translation into over 100 languages, a read aloud function, reading pace options, a picture dictionary, grammatical categorization and adjustable text preferences like font and spacing. Participants will be able to try, discuss and share their experiences with this or similar tools. The session is hands-on and practical but builds on our ongoing research project about translanguaging and technology, where we have interviewed L2 learners about their experiences using the IR.

Microsofts' Immersive Reader as translanguage-enabling technology in second language acquisition.
Presenting Author: Sonja Nygaard-Joki, Oestfold University College, Norway; **Presenting Author:**Stine Brynildsen, Østfold University College, Norway

Please bring your own device if you are attending this ICT demonstration.

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Session C 1

22 August 2023 17:15 - 18:45
AUTH_CH
Invited Symposium

Raising awareness about online readers' awareness: digital competence in multiple-text contexts

Keywords: Digital Literacy and Learning, E-learning/ Online Learning, Educational Technologies, Higher Education, Metacognition, Pre-service Teachers, Primary Education, Reading, Writing/Literacy
Interest group: SIG 02 - Comprehension of Text and Graphics
Chairperson: Christian Tarchi, University of Florence, Italy
Discussant: Elena Florit, University of Verona, Italy

When reading online, people must integrate several complex processes to deeply elaborate the content. People need digital competences to seek information on the web, evaluate the credibility of the sources and integrate information across texts. Awareness represents a key process for readers to self-regulate and sustain their reading activity until aims are achieved. At the same time, teachers' need to be aware too of what processes are involved in online reading to support their students.We present four studies with the purpose of discussing the role of metacognitive awareness of one's cognitive and motivational processes while reading. One study investigated what strategies children use and which dimensions of reading competence they set in motion when seeking information online. One study investigated the structure of credibility evaluation when adolescents read and evaluated multiple online texts. One study investigated whether students were aware of the strategies used when integrating information across content. Finally, one study investigated the issue from the perspective of teachers by examining their perceptions of integration processes, of the challenges of teaching integration, and of best instructional practices.The symposium contributes to our understanding of online reading processes across different ages (from primary school students to adults) and actors (students and teachers). It emphasized the importance of awareness in promoting reflective behaviors when we turn to the Internet to increase our knowledge about complex topics. On an educational level, the symposium provides useful indications on how students' and teachers' awareness should be targeted to increase online reading performance.

Eight-year-olds seeking information with Ipads: dimensions of reading competence
Presenting Author: Eva Brante, Malmö University, Germany; **Co-Author:**Robert Wallden, Malmö University, Sweden; **Co-Author:**Kim Ridell, Malmö University, Sweden

Children use digital environments at an early age and should be supported from the start of school to a conscious and critical way of navigating the internet. Previous studies show that children have vague ideas about how the information has ended up on the internet, how it should be read and evaluated. In this exploratory study, we investigated how children start an internet search, how they formulate their search query and what they pay attention to when the search result is obtained, as well as how they read the information from the screen. 15 eight-year-old children performed the searches in small groups, using one tablet in joint searches. The children's speech and screen activity were recorded. The data was analyzed with the help of Luke and Freebody's resource model to call in different dimensions of reading competence that are actualized when students initiate searches and navigate search results. The results show that the students can use speech and writing to quickly search for specific information. At the same time, they are disinclined to stop and reflect on the relevance, credibility, and sender of the search results. With interactional support, some students were able to identify the sender of the information and reason about which

type of sender might be credible. To reach a more developed thinking and awareness that digital information has a sender, teaching that promotes critical information awareness and multimodal text competence is required.

Successful Evaluation of Online Texts Requires Skills to Confirm and Question the Credibility
Presenting Author: Carita Kiili, Tampere University, Finland; **Co-Author:**Eija Räikkönen, University of Jyväskylä, Finland; **Co-Author:**Ivar Braten, University of Oslo, Norway; **Co-Author:**Helge Stromso, University of Oslo, Norway; **Co-Author:**Michelle Schira Hagerman, University of Ottawa, Canada

Previous research has widely assessed students' credibility evaluation skills with different types of measures and indicators. Consequently, results are fragmented and difficult to compare. Further, there is no clear understanding of the structure of credibility evaluation. The present study examined the structure of credibility evaluation when students read online texts. The participants were 265 sixth grades (M_{age}= 12.45) recruited from five Finnish elementary schools. Students' credibility evaluation skills were measured with a web-based task in which students read four online texts on sugar effects. Two texts were more credible (a popular science text and a newspaper article) and two were less credible (a laypersons' blog text and a commercial text). After reading each text, students evaluated the author's expertise, the author's benevolence, and the quality of the evidence. After completing all evaluations, students were asked to rank the texts according to credibility. Four competing measurement models of students' credibility evaluation were compared. The model termed the Genre-based Confirming-Questioning Model reflected the structure of credibility evaluation best. This model suggests that credibility evaluation reflects the source texts and requires two latent skills: confirming the more credible texts and questioning the less credible texts. The skills of confirming and questioning the credibility were positively associated with students' ability to rank the texts according to credibility The study suggests that the structure of credibility evaluation might be more complex than previously conceptualised. Instruction should ensure that students have opportunities to carefully analyse different credibility aspects of more and less credible texts.

Readers' awareness in the use of intertextual strategies when reading multiple texts
Presenting Author: Lidia Casado Ledesma, University of Florence, Italy; **Co-Author:**Christian Tarchi, University of Florence, Italy

Multiple text comprehension tasks are increasingly required at university. These activities demand making connections across the sources and put into practice intertextual strategies. Multiple text comprehension tasks require the activation of high order skills as metacognition. Despite the role that metacognitive awareness plays in reading processes, there are no known antecedents of studies in which it has been related to strategies specifically linked to intertextual integration when reading texts with conflicting information. Therefore, the present study has the following objectives: 1) to assess undergraduate students' awareness of the use of intertextual integration strategies when reading texts with conflicting information and producing argumentative essays on the topic and 2) to analyze the impact of readers' awareness of intertextual strategies on the multiple text comprehension, inferred through the quality of the argumentative essays. Seventy-three university students participated in the study. The students read the texts on the subject of red meat consumption and its relation to cancer. After the reading, they were asked to write an argumentative essay expressing their opinion about the topic. They were then presented with reflection questions about the intertextual integration strategies they had employed in their essay (refutation, weighing or synthesizing). The analysis reveals a lack of awareness in the application of intertextual integration strategies. Also, we found a significant difference in the argumentative quality of the essays in favor of students in whom a correspondence is observed between the strategy report and its effective use.

Teachers' Perceptions of Multiple-Text Integration: Instructional Challenges and Practices
Presenting Author: Liron Primor Grunfeld, Hemdat Academic College, Israel; **Co-Author:**Sarit Barzilai, University of Haifa, Faculty of Education, Israel

Teachers' knowledge of reading- and writing-related concepts has gained interest due to students' difficulties in developing adequate literacy skills. Multiple-text integration is an important but highly complex 21st century literacy skill. To better understand language arts teachers' knowledge of multiple-text integration, we examined teachers' perceptions of integration processes, of the challenges of teaching integration, and of best instructional practices. Fifty-four teachers answered open-ended questions using an online questionnaire. Teachers' answers were analyzed in light of the MD-TRACE model (Rouet & Britt, 2011). Results suggested that teachers are familiar with the steps of selecting information, organizing it, and identifying relationships between texts. However, teachers did not refer to source evaluation, to the recursiveness of reading and writing, and to metacognitive monitoring. The most common teaching challenges were coping with students' low basic reading and writing skills as well as lack of motivation. As for instruction, teachers mostly focused on teaching how to integrate, whereas instructional practices aimed at understanding the value of this task and standards of integration quality were scarce. In sum, the results demonstrate that teachers have rich knowledge of multiple-text integration and view this as a difficult task that pushes the boundaries of students' literacy skills. Teachers respond to these challenges by breaking-down the task and focusing on integration processes. These attempts could potentially be strengthened by paying more attention to students' appreciation of the importance and meaning of integration and by fostering their self-regulation skills.

Session C 2

22 August 2023 17:15 - 18:45
UOM_CH
Invited Symposium

Educating the developing mind: an overarching theory for development and learning

Keywords: Cognitive Development, Cognitive Skills and Processes, Developmental Processes, Learning and Developmental Difficulties, Problem Solving, Social Aspects of Learning and Teaching
Interest group:
Chairperson: ANDREAS DEMETRIOU, Cyprus
Organiser: ANDREAS DEMETRIOU, Cyprus
Discussant: Roger Saljo, University of Gothenburg, Sweden

The symposium outlines a recent book presenting an integrated theory of intellectual development and its implications for education. The architecture of the human mind, its development, and the factors associated with individual differences are described. The notion of developmental priority is central in the theory. It postulates that the cognitive processes defining general cognitive ability change at successive periods of development. Action control, attention control and representational awareness, inductive reasoning and inferential awareness, and deductive reasoning and truth awareness dominate in infancy, preschool, primary school, and secondary school, respectively. These interact with conceptual domains, such as mathematics, language, space, and social relations, defining learning and problems solving. Neurodevelopmental disorders are also discussed. The book was a collective enterprise. In the symposium authors present chapters of the book. Andreas Demetriou outlines the theory and its general educational principles. Samuel Greiff focuses on implications for problem solving. Mari-Pauliina Vainikainen focuses on social and cultural context of learning as integrated in the theory. George Spanoudis focuses on using the theory for diagnosis and treatment of developmental disorders such as autism, ADHD, and dyslexia. Roger Saljo will provide an overall discussion of the theory and the symposium.

A comprehensive theory of intellectual development and its application to education
Presenting Author:ANDREAS DEMETRIOU, University of Nicosia and Cyprus Academy of Sciences, Letters, and Arts, Cyprus

This presentation is part of the the symposium "Educating the developing mind: an overarching theory for development and learning".

A developmental approach to problem solving
Presenting Author: Samuel Greiff, University of Luxembourg, Luxembourg

This presentation is part of the the symposium "Educating the developing mind: an overarching theory for development and learning".

Contextual frames for development and learning
Presenting Author: Mari-Pauliina Vainikainen, Tampere University, Finland

This presentation is part of the the symposium "Educating the developing mind: an overarching theory for development and learning".

A new framework of understanding and educating individuals with developmental disorders
Presenting Author: Spanoudis Georgios, University of Cyprus, Cyprus

This presentation is part of the the symposium "Educating the developing mind: an overarching theory for development and learning".

Session C 3

22 August 2023 17:15 - 18:45
UOM_A13
Symposium
Learning and Instructional Technology

Sustainable learning in digital futures: ethics and values in data-driven educational practices

Keywords: Artificial Intelligence, Assessment Methods, Conceptual Change, Cultural Diversity in School, Educational Policy, Educational Technologies, Ethics, Higher Education, Learning Analytics, Morality and Moral Development, Qualitative Methods, Science and STEM, Teacher Professional Development, Tool Development
Interest group: SIG 04 - Higher Education, SIG 14 - Learning and Professional Development, SIG 27 - Online Measures of Learning Processes
Chairperson: Giulia Messina Dahlberg, University of Gothenburg, Sweden
Organiser: Ylva Lindberg, Jönköping University, Sweden
Organiser: Teresa Cerratto-Pargman, Stockholm University, Sweden
Discussant: Anders Buch, Denmark

This symposium brings together empirical and conceptual research on Education from different European regions and different epistemological perspectives about the relationship between data-production by digital systems and so-called data-driven educational practices. Digital data, as a sociotechnical constructed entity, ontologically bears moral values of what is legitimate in a particular context and for certain groups of users. The tension embedded in the theme “sustainable learning in digital futures” concerns how to make sense of the pedagogical value accorded to data and that this value is pluri-faceted and related to norms. In particular, this symposium explores the ethical problems that arise when learning is enmeshed in data generation processes wherein participants are not only active contributors but are also expected to be literate in how to interpret and use the data they produce to make informed decisions (Shibani, Knight & Buckingham Shum, 2022). The studies aim to spark the dialogue on the issues above in two ways: firstly, they trouble the epistemologies of “data” by considering data creation and its use in relation to “sustainable learning” that is, if technology is constantly learning and so are participants in data-driven educational practices, where is the boundary between who/what is learning, how, what, and why? How do we account for these shifts and create understandings of the learning of tomorrow? Secondly, they discuss how different imaginaries of sustainable learning in digital futures are inevitably linked to hierarchies of what counts as relevant knowledge, competences and skills to cope with current and future global challenges.

Visualizing data packets to reveal data infrastructures and data assets: The InfraReveal Tool
Presenting Author: Marie Utterberg Modén, Department of Applied IT, University of Gothenburg, Sweden; **Co-Author:**Svea Kiesewetter, University of Gothenburg, Sweden; **Co-Author:**Annika Bergviken-Rensfeldt, Department of Applied Information Technology, University of Gothenburg, Sweden, Sweden; **Co-Author:**Thomas Hillman, Department of Applied Information Technology, University of Gothenburg, Sweden, Sweden

As schools increasingly digitalize their work, they also generate immense data flows that build on student data. In line with this, student users turn into valued assets and valuable investment for the future revenue, apart from the evidenced commercial interests in data from infrastructural providers and third-party developers. With this study, we aim to increase the awareness of the production of data and data flows by revealing the data infrastructures and values at stake for schools and teachers as data and student users become assets. Our work is based on a participatory design project which involved secondary school teachers. By using data packet tracing techniques, we developed the InfraReveal tool, that visualizes the otherwise hidden and opaque data packet traffic exchanged across the world when individuals access the internet. Our results show how teachers respond to visualizations of data packet tracing and what data tracing tools can reveal about data infrastructures and data assets. This paper contributes to the symposium through its focus on value issues at stake arising in the relationship between school data generation, data-driven practices, and the value of data for different parties.

Ethics of AI-driven automated systems for assessment
Presenting Author: Alexandra Farazouli, Stockholm University, Sweden

Applications of Artificial Intelligence in Education (AIED) promise to facilitate student learning and take the burden from university teachers’ workloads. In particular, AI-driven automated systems for assessment in education are often presented as enriching and advancing assessment procedures supporting teachers and administration staff. Notwithstanding the potential benefits that such systems could bring to educational contexts, several ethical concerns remain regarding; their accuracy in predicting grades, the pedagogical choices made by the end-users when engaging with these systems, and their influence on teachers’ decision-making. This conceptual paper focusing on automation in assessment aims to highlight the multifaceted nature of AI-powered automated grading systems (AGS) in education and discuss their ethical considerations for sustainable future learning environments. Such considerations are central to contributing to sociotechnical imaginaries of automation in education that are grounded in the realities of teachers’ and students’ everyday practices.

Focusing Bias Analyses: Responsible Learning Analytics in the Context of STEM Identity Development
Presenting Author: Adrian Grimm, IPN - Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Anneke Steegh, IPN-Leibniz Institute for Science and Mathematics Education, Olshausenstraße 62, D-24118 Kiel, Germany, Germany; **Co-Author:**Marcus Kubsch, IPN-Leibniz Institute for Science and Mathematics Education, Olshausenstraße 62, D-24118 Kiel, Germany, Germany; **Co-Author:**Knut Neumann, IPN-Leibniz Institute for Science and Mathematics Education, Olshausenstraße 62, D-24118 Kiel, Germany, Germany

Navigating 21st century challenges requires competent science, technology, engineering and mathematics (STEM) professionals. A contemporary approach to support students in their STEM competence development are learning analytics. Learning analytics are mainly discussed in the context of STEM competence development. However, we propose to discuss learning analytics in the context of STEM identity development. Students who develop stronger STEM identities are more likely to have STEM career aspirations and persistence – and eventually become STEM professionals. At the same time, STEM identity development differs across different groups of students as the students bring diverse experiences and backgrounds to schools. STEM identity development opens up new perspectives on how bias analyses of learning analytics systems need to be performed and which analyses to focus on. Through selected examples from a STEM education project in secondary schools in Germany, we show the implications a STEM identity development perspective has for bias analyses in learning analytics. Ultimately, we aim at enabling all students to develop STEM identities.

CANCELLED: Data-imaginaries Tacit Ethics in AI-Research (...)
Presenting Author: Joakim Juhl, TU Munich, Germany

This presentation has been cancelled and will not be presented at EARLI 2023.
This paper investigates the political space for higher education and what kind of futures that are imagined for data-driven educational practices both by AI researchers and within the broader society. Data-driven practices have significantly increased over the past two decades and transpire into evermore areas each day. Corresponding policies attempt to both promote and harness this technological transformation while also guide, steer and govern its directions and impacts. By studying recent initiatives in AI research, data-oriented innovation and national tendencies in higher education, this paper will use the concept of sociotechnical imaginaries as a bi-directional kaleidoscope to illustrate how contemporary cultural formations collectively see future technological directions as basis for their reading of the past, and how collective values and ethics present themselves in envisioned moral practices and expertise hierarchies on datafication. The analysis will highlight the asymmetries between investments in ‘hard’ computer science to promote technological developments and impacts,

and the reduced attention to social sciences and humanities (SSH) as capable resources for guiding, steering and integrating potential impacts in socially desirable ways. By exploring how AI researchers express tacit ethics in their work, the paper will propose new potential inroads for SSH to aid and steer future direction of data-driven practices both in education and in broader society.

Session C 4

22 August 2023 17:15 - 18:45
UOM_A02
Symposium
Assessment and Evaluation

What do we get if we measure teaching quality? Validity and stability of different approaches

Keywords: Assessment Methods, Classroom Assessment, Meta-analysis, Quantitative Methods, School Effectiveness, Teacher Effectiveness
Interest group: SIG 18 - Educational Effectiveness and Improvement
Chairperson: Sebastian Röhl, University of Tübingen, Germany
Organiser: Sebastian Röhl, University of Tübingen, Germany
Discussant: Mark WHite, University of Oslo, Norway

Good and effective teaching is expected to be associated with a high level of subject learning achievement but also of cross-curricular, motivational, and affective outcomes. For this purpose, teaching quality research focuses on learning-conducive characteristics of teaching, here understood as a social practice that is co-constructed around content by students and teachers. In this context, measurement of these learning-conducive characteristics is crucial.In the scientific literature, a variety of different dimensional frameworks of teaching quality can be found; some based on theoretical considerations, others on empirical findings. Based on the empirically founded framework of the three generic basic dimensions, the first paper uses observer ratings of current and 20-year-old teaching videos to analyze the stability of this dimensional framework and changes in teaching quality over this period.Furthermore, student surveys are often used to measure teaching quality. In a meta-analysis, the second paper investigates the correlation of student ratings with learning achievement in classes. Focusing on possible measurement bias, contribution three analyses response shifts in the case of multiple use of the same questionnaire with the same students.Finally, the last paper focuses on the very relevant question for practical school development, to what extent the ratings of teaching quality of school inspectors, students, and teachers differ and how far they are useful as a source of information for possible requirements for development.Summarizing, the findings are discussed regarding their significance for further teaching quality research.

Teaching quality: What has changed in the last twenty years?
Presenting Author: Wida Wemmer-Rogh, University of Zurich, Switzerland; **Co-Author:**Leonie Gossner, University of Zurich, Switzerland; **Co-Author:**Patrick Schreyer, University of Kassel, Germany; **Co-Author:**Urs W. Grob, University of Zurich, Switzerland; **Co-Author:**Eckhard Klieme, German Institute for International Educational Research (DIPF), Germany; **Co-Author:**Anna-Katharina Praetorius, University of Zurich, Switzerland

Classroom management, cognitive activation and student support are key dimensions of teaching quality. To investigate changes in teaching quality over time, classroom videos from two studies conducted over two decades apart, the TIMSS Video Study Germany 1995 and the TALIS Video Study Germany 2018, were empirically re-analyzed. Trained raters conducted new standardized evaluations of n=44 videos from each study (total N=88). Long-term changes in teaching quality are examined based on (a) analyzing measurement invariance between the two studies and (b) group comparisons of means of the teaching quality dimensions in cases when sufficient measurement invariance is given. For cognitive activation, which was modeled two-dimensionally, scalar measurement invariance was found between the two sub-samples making a meaningful interpretation of the latent mean differences possible. The factor representing the potential of cognitive activation is significantly higher in 2018 compared to 1995, while the factor covering the cognitive activity of the students shows no significant difference. Measurement invariance could not be demonstrated for the other two dimensions of teaching quality; therefore, mean comparisons were not possible in a meaningful way. The results provide insight into the changes of teaching processes in German classrooms between 1995 and 2018 and beg the question whether teaching quality can be considered a stable construct over this long timespan.

Effects of Student Ratings of Teaching Quality on Learning Achievement – A Meta-analysis
Presenting Author: Sebastian Röhl, University of Tubingen, Germany; **Co-Author:**Ann-Kathrin Jaekel, University of Tuebingen, Germany

In K-12 education, student ratings are an inexpensive, effective, and low-threshold way to capture teaching quality from the students' perspective. The validity and reliability of student ratings for assessing teaching quality along different quality dimensions has been demonstrated in previous research (Kuhfeld, 2017; Wagner et al., 2013). Additionally, several studies have shown the relevance of students' perceptions of their learning environment for learning different outcomes (e.g., Kane & Staiger, 2012; Wallace, Kelcey, & Ruzek, 2016). Nevertheless, the question of explicitly the ratings of students are associated with student achievement measures from a meta-perspective has not been addressed in recent research in detail. The present study therefore seeks to investigate in a meta-analysis how different dimensions of teaching quality, rated by students, are associated with their academic achievement. For the categorization, we used a comprehensive scheme which serves for the coding of the studies published since the year of 1980. Preliminary analysis points to a significant mean weighted effect of r = .188 between students' perceptions of teaching quality and learning achievement. In deepening moderator analyses, we found a significant higher effect for students' perception of content selection and presentation, whereas the level of analysis (e.g., student or class level) and the study design (longitudinal or cross-sectional) revealed no significant associations.

Changing Teaching or Changing Perspectives? Response Shifts in Student Ratings of Teaching Quality
Presenting Author: Jonathan Schweig, RAND Corporation, United States; **Presenting Author:**Jose Felipe Martinez, University of California, United States

Student ratings are often used to understand and monitor teaching quality and other important aspects of the classroom learning environment that have been positively linked to student learning outcomes. Policymakers and practitioners are often interested in monitoring change in climate quality from year to year (e.g., Klosterman et al. 2014). However, response shifts (changes in internal standards of measurement) can potentially compromise inferences about change over time. While this phenomenon has been studied widely in other fields, it has received relatively little attention in educational research. Utilizing data collected as a part of a large-scale study in Nigeria, we analyzed survey responses from 160 primary school classrooms. We found evidence that students recalibrate their use of survey scales across administrations, suggesting that their internal standards of measurement may also change over time. We show how accounting for this recalibration can alter inferences about true changes in teaching quality over time and discuss the implications for the use of indicators derived from student surveys for teacher formative and summative evaluation.

Teaching Quality in Dutch Schools from the Perspectives of School Inspectors, Students, and Teachers
Presenting Author: Hannah Bijlsma, University of Twente, Netherlands; **Co-Author:**Adrie Visscher, Univ. of Twente, Netherlands; **Co-Author:**Cees Glas, University of Twente, Netherlands

Because teaching quality (TQ) is the most important, malleable factor that impacts student achievement, it is important for the Dutch Inspectorate of Education to monitor the quality of teaching in Dutch secondary schools. In a collaborative project between the University of Twente and the Inspectorate, the inspector, teacher and student perspectives of TQ were measured in 946 lessons. We analysed the three perspectives using an IRT and GT modelling approach to indicate whether the three perspectives differ in ratings and item difficulty. We also conducted deepening analyses to investigate to what extent potentially related factors at the classroom, teacher and school levels are associated with the inspector ratings of teaching quality. In our presentation, we will discuss the implications of the differences between the ratings of the three rater types and how findings can be used in research and in the practice of schools and school inspectors.

Session C 5

22 August 2023 17:15 - 18:45
UOM_A03
Symposium
Higher Education

Factors supporting successful transition from higher education to working life

Keywords: At-risk Students, Competencies, Curriculum Development, Higher Education, Mentoring and Coaching, Metacognition, Qualitative Methods, Quantitative Methods, Self-efficacy, Social Interaction
Interest group: SIG 04 - Higher Education
Chairperson: Heidi Hyytinen, University of Helsinki, Finland
Discussant: Maaike Endedijk, University of Twente, Netherlands

Transition to working life can be challenging for many graduates because academic degree as such does not necessarily guarantee success in working life. This symposium with four studies utilizing various methods advocates better understanding how higher education can better support students' transition to working life, and what kind of factors contribute to early career success. First longitudinal study explores employability factors and their association with this transition and with early career success. Second study investigates how well different study programmes prepare students to learn various generic skills. Third study analyses how graduates perceive coaching practices in higher education and how coaching prepares them to make a successful transition, while fourth study concentrates on the role of networks in the phase of transition. The present symposium provides new knowledge about key employability factors and how higher education institutions can better support graduates' transition to working life.

Transition to working life - which employability factors contribute graduates' early career success?
Presenting Author: Tarja Tuononen, University of Helsinki, Finland; **Co-Author:**Heidi Hyytinen, University of Helsinki, Finland

The transition from university to working life is a challenging phase for graduates. The focus in the present longitudinal study is on employability factors and their association with this transition and with early career success. The participants were 43 graduates who were interviewed at the time of their graduation and filled in a follow-up questionnaire three years later. The data were analysed using qualitative content analysis. The results revealed five employability factors relating early career success: (1) career plans and goals, (2) perceived competences related to the degree, (3) self-efficacy beliefs, (4) activity and (5) work experience and networks. Three transition groups emerged based on the differences in employability factors and career success, which we labelled smooth transition, progressive transition and a rocky road. The results revealed individual variation in employability factors and in the kind of challenges these graduates encountered in the transition phase and in their early career. An awareness of the ways in which graduates differ could help educators to develop practises that better support students and graduates in the transition to working life. These findings highlight the importance of active career planning during one's studies.

Discipline-specific Profiles for Learning Opportunities of Generic Skills in Higher Education
Presenting Author: Katharina Lohberger, Justus Liebig University Giessen, Germany; **Co-Author:**Edith Braun, Justus-Liebig-University Giessen, Germany

The link between education and professional career is well known, especially generic skills are an central aim of higher education. But not much is known on how well different study programmes prepare students to gain generic skills, which are required on the labour market. To address this issue, we adapted a questionnaire, which was developed for graduates, in a students´ survey, asking for learning opportunities for generic skills. 6,982 students from different study programmes filled in the questionnaire. Cluster analyses revealed three different clusters of learning opportunities, with one cluster of providing good opportunities to gain diverse areas of generic skills, one cluster of less opportunities, and one cluster where especially physical work is fostered. Furthermore, the learning opportunities for generic skills differ between the fields of study. It shows that fields like humanities seem to have higher learning opportunities for generic skills. Our results provide an empirical basis for a discussion of which generic skills are supported in study programmes, which can be useful in the area of quality management of teaching and learning as well as for the accreditation and for evidence-based curriculum development.

How does coaching facilitate students' education-to-work transition?
Presenting Author: Niels van der Baan, Maastricht University School of Business and Economics, Netherlands; **Co-Author:**Simon Beausaert, Maastricht University, Netherlands; **Co-Author:**Wim Gijselaers, Maastricht University School of Business and Economics, Netherlands; **Co-Author:**Inken Gast, Maastricht University, Netherlands

The school-to-work transition challenges many graduates. More than half of the graduate employees leave their first job because they fail to adjust. It requires employability competences, such as lifelong learning skills, to adjust to the requirements of the workplace. To equip students with essential employability competences higher education institutes have introduced coaching as part of their teaching programs. However, it remains unclear whether this is effective from an educational perspective. The present study evaluates coaching practices in higher education, as perceived by recently graduated employees. We conducted semi-structured interviews with starting employees who participated in coaching activities in higher education (N= 16). We coded the interviews deductively and inductively and analysed them thematically. Preliminary results suggest that graduates were satisfied with the coaching they received in higher education, and they believed that coaching has prepared them for their school-to-work transition. We identified reflection as the main mechanism for developing employability competences. Graduates indicated that the coaching practice helped them to acquire reflection skills that helped them to continuously develop their employability competences at the workplace. The present study shows that the coaching practice in higher education prepares graduates for the workplace by creating a habit of reflection. These results add to the transition literature by demonstrating how graduates successfully adjust to the workplace. Results also provide insights into how higher education can best prepare students for their transition to the workplace.

Graduates navigating on the labour market: A social network perspective
Presenting Author: Ayla De Schepper, University of Antwerp, Belgium; **Co-Author:**Noel Clycq, University of Antwerp, Belgium; **Co-Author:**Eva Kyndt, Swinburne University of Technology, Australia

Young graduates are embarking on their careers in increasingly competitive and challenging settings. A successful transition to work is no longer just about educational advantage based on the quality of the degree. Specifically, gaining access to the 'right' resources and applying them strategically is crucial. This implies graduates need to understand the role of covert mechanisms and gain insight into which resources have a (signalling) value to create an advantage in a specific context. However, developing this 'feel for the game' in a new context and being able to identify valuable resources is challenging. To develop this 'feel for the game', graduates mainly rely on interactions with actors from their social network. As graduates with vulnerable socio-economic backgrounds generally have more limited networks with fewer resources, the transition could be increasingly precarious for them. To grasp these mechanisms and understand how graduates engage with them, our longitudinal interview-diary study (n = 36) focuses on the role of ego networks in influencing graduates' understanding of the labour market. More specifically, we examine the role of network resources, structure and composition in how graduates develop an understanding of what it takes to make a successful transition. The preliminary results show that graduates mostly rely on strong family ties during their first weeks on the labour market. During this period the resources that were shared most often were information about what career to pursue and how working life will be. Only a few graduates had professional contacts who could help with instrumental tasks.

Session C 6

22 August 2023 17:15 - 18:45
UOM_A11
Symposium
Motivational, Social and Affective Processes

Predictors and outcomes of heterogeneity in motivational development in early secondary school

Keywords: Achievement, Developmental Processes, Emotion and Affect, Instructional Design, Mathematics/Numeracy, Motivation, Reading, Secondary Education, Self-concept
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Wendy Symes, University of Potsdam, Germany
Chairperson: Rebecca Lazarides, University of Potsdam, Germany
Discussant: Barbara Flunger, Utrecht University, Netherlands

Research examining the development of motivation across a range of academic subjects has typically adopted a variable-centred approach. Whilst this approach has been useful for identifying factors which may influence, or be influenced by, motivation, they are limited in that they assume all students follow a similar developmental trajectory. Adopting an expectancy-value perspective, the four papers included in this symposium seek to examine ways in which developmental trajectories of self-expectancy and value differ between groups of students, and to identify predictors and outcomes of this heterogeneity. The studies presented in this symposium cover a range of subjects (e.g. Maths and Reading), school years (grades 5 to 10), predictors (e.g. gender, instructional design) and outcomes (e.g. competence, wellbeing), yet all of them provide evidence of heterogeneity in motivational development. Three of the studies adopt person-centred approaches (e.g. latent transition analysis) to identify groups of students who differ in their motivational trajectories in one academic subject over time, whilst the fourth uses structural equation models to examine how the development of motivation in two academic subjects simultaneously changes as a function of age. Taken together, these studies highlight ways in which different combinations of expectancy and value can differentially develop and influence student outcomes. The findings from these papers could be used by schools and teachers to identify students who are most at-risk of lower or declining motivation, and poorer outcomes, allowing them to direct their resources to support their most vulnerable students more effectively.

Comparison Effects of Students' Achievements on Self-Concepts and Task Values in Secondary School
Presenting Author: Hanna Gaspard, TU Dortmund University, Germany; **Co-Author:**Ann-Kathrin Jaekel, University of Tuebingen, Germany; **Co-Author:**Richard Goellner, University of Tuebingen, Germany

Drawing on the internal/external frame of reference model (Marsh, 1986), prior research has found that students' self-concepts and task values are informed through an external frame of reference in which students compare their achievements socially (i.e., with those of their peers) and an internal frame of reference in which students compare their own achievements dimensionally (i.e., across domains). Although prior research has pointed towards stronger comparison effects for older students, more systematic research is missing to test such comparison effects for students' self-concepts and task values. The present study therefore aimed to examine the extent to which social and dimensional comparison effects on students' self-concepts and task values in math and students' native language varied depending on students' grade level. Students' achievements, self-concepts, and task values in math and German language arts were assessed in a German sample of 6,479 students in Grades 5 through 10 out of different school types. Structural equation models provided evidence for social and dimensional comparison effects of students' grades and tests scores on self-concepts and task values across grade levels. Moreover, both social and dimensional comparisons were more pronounced for students in higher grade levels. This increasing use of social and dimensional comparisons can help to explain the processes underlying the development of students' self-concepts and task values.

Stability and Change in Students' Motivation Profiles: The Role of the Instructional Design
Presenting Author: Tanja Held, University of Bern, Switzerland; **Co-Author:**Julia Morinaj, University of Bern, Switzerland; **Co-Author:**Tina Hascher, University of Bern, Institute of Educational Science, Switzerland

Student motivation can be considered as a manifold phenomenon to which different motivational characteristics contribute. Existing research has shown that different motivational profiles can be identified and that these profiles may change over time. According to the expectancy-value theory, students expectancies and values play an important role for student motivation. Thus, the first research question of our study was to examine students' motivation profiles based on the expectancies and values in lower secondary education. Second, we investigated how these motivation profiles change during Grades 7, 8, and 9. Third, we included characteristics of the instructional design (perceived autonomy support, competence support, instructional style, error culture) to investigate how they influence the changes between motivation profiles. Using Latent Profile Analysis (LPA), motivation profiles of 605 lower secondary school students were recorded based on their reported expectation of success, utility value, attainment value, intrinsic value, and cost. Subsequently, the transition probabilities between the profiles were estimated using Random Intercept Latent Transition Analysis (RI-LTA). Finally, the factors of the instructional design were included in the RI-LTA. Results revealed three motivation profiles: a 'low value, high cost profile', a 'high value, low cost profile', and an 'average and low utility profile'. RI-LTA revealed a high stability of profile membership over time. However, the instructional design predicted changes in profile membership. These results may help to identify and address students who might be at risk for a motivational decline and point to the role of the instruction for students' motivation development.

Motivational Profiles in Mathematics - Stability and Links with Educational and Emotional outcomes
Presenting Author: Anna Widlund, Åbo Akademi University, Finland; **Co-Author:**Heta Tuominen, University of Eastern Finland, Finland; **Co-Author:**Johan Korhonen, Åbo Akademi University, Finland

Grounding on expectancy-value theory, this study investigated change and stability in adolescent students' (N = 508) motivational profiles in mathematics during the last year of comprehensive education, and how these relate to relevant educational outcomes (mathematics performance and aspirations) and students' well-being (study-related exhaustion and general depressive symptoms). Latent profile and transition analysis revealed four motivational profiles among students: *Positively motivated* (high expectancy and value beliefs, low costs), *Struggling ambitious* (high expectancy and value beliefs, high costs), *Indifferent* (low expectancy and value beliefs, low costs), and *Maladaptive* (low expectancy and value beliefs, high costs). Although some fluctuations were detected in profile memberships within the school year, the majority of the students (80%) displayed stable mathematics motivation across 9th grade. Students who remained *Positively motivated* also performed well, aspired for an education that required high mathematical skills, and experienced the least problems with their well-being (study-related exhaustion, depressive symptoms), whereas students in the most negative motivational profile (*Maladaptive*) showed the opposite patterns. However, interestingly, students who experienced high math-related costs, despite having positive value beliefs, performance and aspirations (i.e., *Struggling ambitious*), also experienced one of the highest levels of study-related exhaustion and depressive symptoms. Elevated levels of exhaustion and depressive symptoms were also associated with negative motivational transitions in general (i.e., moving from *Positively motivated* to *Struggling ambitious*, or from *Indifferent* to *Maladaptive*), highlighting the importance of supporting students' well-being and reducing perceived study-related costs in schools as well.

Interindividual differences in the development of reading self-concept and value in secondary school
Presenting Author: Wendy Symes, University of Potsdam, Germany; **Co-Author:**Rebecca Lazarides, University of Potsdam, Germany; **Co-Author:**Jan Retelsdorf, University of Hamburg, Germany

Adopting a situated expectancy-value theory perspective (SEVT), this study examined interindividual differences in intraindividual development of reading self-concept and values throughout early secondary school, and associated predictors and outcomes. Reading self-concept, intrinsic value and importance value, and reading competence data was collected from 1507 (49% girls) German secondary school students throughout grades 5, 6 8 and 9. Growth mixture modelling indicated there were four heterogeneous developmental trajectories: *Trajectory 1*: Low but increasing values, low and stable self-concept; *Trajectory 2*: Moderate and declining importance value, low and stable self-concept and intrinsic value; *Trajectory 3*: High and declining values, moderate and stable self-concept; and *Trajectory 4*: High and declining self-concept and values. Students following *Trajectory 4* were more likely to be female than students following *Trajectory 1 or Trajectory 3*, and were more likely to be of higher SES than students following any of the other three trajectories. Students following Trajectory 4 also attained the highest reading competence scores in grade 9, although their scores were significantly higher than students following Trajectory 2 only. Findings provide support for SEVT, especially in relation to the impact of socialisation on interindividual differences in intraindividual development. However, they also suggest that both the level of expectancy and value beliefs, as well as the developmental trajectory followed, are related to performance.

Session C 7

22 August 2023 17:15 - 18:45
AUTH_DC2
Symposium
Learning and Instructional Technology

How to design effective educational video?

Keywords: Comprehension of Text and Graphics, Computer-assisted Learning, Eye Tracking, Instructional Design, Multimedia Learning, Video-based Learning
Interest group: SIG 02 - Comprehension of Text and Graphics
Chairperson: Kevin Ackermans, Netherlands
Organiser: Kevin Ackermans, Netherlands
Discussant: Mireille Bétrancourt, University of Geneva, Switzerland

The forced large-scale implementation of Emergency Remote Teaching during the COVID pandemic has uncovered how little we know about designing effective educational video. This symposium focuses on the design of educational video, contributing to the questions of these uncertain times. Should you use emotional design, talking head, subtitles or prompts or in your educational video? The first paper by Endres et. al. dives into the world of emotional design of educational video. The authors investigate the narrative frame and its effects on different phases of learning. The second paper by Sonderman et.al. tackles a question asked by many teachers; are my students distracted by my talking head on video? The authors investigate the effects of instructor presence in educational videos on knowledge and picture recognition task performance. The third paper by Pannatier et. al. explores learning from video content in a second language. A topic of exceptional relevance in the turmoil of today's world. The authors investigate if language proficiency matters more than captions or subtitles. The final paper by Krebs et. al. focusses on the question if prompts can help teachers implement educational video to scaffold learning.

A narrative frame is essential in emotional design:The role of value in evoking situational interest
Presenting Author: Tino Endres, University of Freiburg, Germany; **Co-Author:**Alexander Eitel, University of Giessen, Germany; **Co-Author:**Alexander Renkl, Universität Freiburg, Germany

Instructional videos in the internet that are emotionally designed frequently begin with a narrative frame highlighting the value of the to-be-learned content. We asked whether the (non-)use of such a frame can partly explain the mixed effects in emotional-design research. We analyzed the effects of emotional design and a value-related narrative frame on learning outcomes using a between-subjects design (N = 128). We expected emotional design with the narrative frame to increase learning especial-ly at the later phases of learning. Therefore, we implemented a repeated measures factor on learning outcome (three video sections). We found a three-way interaction of video format, narrative frame, and video sections with respect to learning outcomes. The narrative frame was essential for that in-crease in learning. Without the narrative frame, emotional design hampered learning.

Distracted by a Talking Head? Effects of Instructor Presence in Educational Videos
Presenting Author: Christina Sondermann, German Institute for Adult Education, Germany; **Co-Author:**Markus Huff, Eberhard Karls Universität Tübingen, Germany; **Co-Author:**Martin Merkt, Deutsches Institut für Erwachsenenbildung, Germany

Should the instructor in educational videos be visible in addition to the actual learning content? Theory and prior research indicate both potential advantages (e.g., deeper processing) and disadvantages (e.g., distraction) of instructor presence in learning videos. Therefore, we conducted an eye tracking experiment in which N = 96 participants watched eight short videos with narrated slides on different topics while their eye movements were recorded. Using a within-subjects design, we varied whether a talking head (TH) was present next to the learning content or not. We aimed to investigate how the TH affects knowledge test performance (recall), picture recognition task performance, video ratings (e.g., satisfaction), and visual attention (fixation duration of the learning content). Preliminary analyses revealed no effect of the TH on knowledge test performance and picture recognition task performance. Pending analyses of the eye tracking data will examine whether the influence of the TH on learning measures is moderated by visual attention on the learning content. Potential explanations for the findings and possible implications of the pending analyses are discussed.

Learning from video with captions vs. subtitles: when second language proficiency matters
Presenting Author: Maria Pannatier, University of Geneva, Switzerland; **Co-Author:**Mireille Bétrancourt, University of Geneva, Switzerland

Learning from expository video content in a second language (L2) has become a commonplace practice in internet-delivered blended and distance learning courses. A typical format is the video recording of live lectures or conferences. In order to help the multilingual audience overcome video comprehension barriers, a concurrent onscreen text transcript of the audio narration can be provided. However, no consensus has been achieved so far in multimedia research regarding the effects of the transcript. Moreover, research on whether these effects are dependent on the language of the transcript, or the learner's L2 proficiency level is scarce. This study aims to explore if the language of the transcript and the learner's L2 proficiency level affect their learning outcomes, cognitive load, and situational interest. 131 French-speaking students were recruited for an online study. They were assessed for L2 proficiency and allocated to elementary, intermediate, and advanced levels. Then they studied a video-recorded conference in three conditions: with captions (in English, same as audio), with subtitles (French translation), or no transcript. No main effect of the transcript condition was found on performance, cognitive load, or interest, nor any interaction between the transcript condition and L2 proficiency. However, there was a main effect of language proficiency on inference and transfer outcomes, as well as on extraneous cognitive load and maintained situational interest, which confirmed the leading role of L2 proficiency level not only for L2 learning with video but in the context of video content learning in L2.

Let me think about it for a moment: Do prompts support learning with explainer videos?
Presenting Author: Marie-Christin Krebs, University of Giessen, Germany; **Co-Author:**Katharina Braschoß, University of Giessen, Germany; **Co-Author:**danielle pelzer, University of Giessen, Germany; **Co-Author:**Alexander Eitel, University of Giessen, Germany

We investigate in two experiments whether and when explainer videos foster subsequent learning from lecture materials. In Experiment 1 (N=137), students watched an explainer-video (vs. read the respective video-script), then received prompts (vs. not), and then studied from textbook lecture materials. We found explainer videos to support subsequent learning from textbook compared to reading the video script first, especially when students also received prompts after watching the explainer videos. Results from Experiment 1 thus suggest that explainer videos best scaffold subsequent learning when the risk of superficial processing is reduced by prompts. Experiment 2 (planned N = 128) seeks to replicate and potentially extent this result to subsequent learning from lecture video, where less scaffolding might be needed compared to the textbook. Students will watch an explainer-video (vs. read the respective video-script), receive prompts, and then watch a lecture video (vs. read the textbook). Again, we expect explainer video with prompts to best scaffold subsequent learning, albeit to a lesser degree when subsequently learning from a lecture videos. Results of Experiment 2 will be presented at the conference.

Session C 8

22 August 2023 17:15 - 18:45
UOM_A05
Single Paper
Learning and Social Interaction

Creating Supportive Learning Settings for Refugee and Migrant Students

Keywords: Bilingual Education, Cooperative/Collaborative Learning, Cultural Diversity in School, Migrant / Refugee and Minority students, Multicultural Education, Qualitative Methods, Social Development, Well-being
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Emilia Andersson-Bakken, Norway

The challenges of using co-creation in schools: The case of the Empowering Young Translators Club
Keywords: Bilingual Education, Cultural Diversity in School, Migrant / Refugee and Minority students, Qualitative Methods
Presenting Author: Sarah Crafter, The Open University, United Kingdom; **Co-Author:**Guida de Abreu, Oxford Brookes University, United Kingdom; **Co-Author:**Nelli Stavropoulou, The Open University, United Kingdom; **Co-Author:**Eleni Stamou, Oxford Brookes University, United Kingdom

This presentation focuses on some of the affordances and challenges of using co-creation and participatory approaches for a school-based intervention aimed at child language brokers. Child language brokers are children and young people who translate and interpret for family members and peers. School is one of the most frequent and important sites where the practice of language takes place (Angelelli, 2016). Sometimes the role of language brokers within school is formalized but in many instances, young people undertake this role on an ad hoc basis in ways that can be both advantageous and burdensome (Crafter et al. 2017). Existing programmes to support young translators in schools mainly focus on pragmatic language skills or buddying systems but pay less attention to the cultural, social and emotional wellbeing elements. Our pilot action involved the development of an after-school club known as the 'Empowering Young Translators' club which took place in a secondary school in a culturally diverse and social deprived neighbourhood in England. The club took place across one academic year (Oct 2021 – July 2022) and involved young people aged between 11-14 years old. Based on detailed fieldnotes, recordings of dialogue with the young people and teaching staff, audio-visual material and semi-structured interviews, we discuss two particular barriers to co-creation 1) the tensions between educational cultural practices embedded in the school institution (e.g. behaviour management) and the young people's burgeoning co-creation empowerment and 2) the impact of age on young people's and the research team's expectations and aspirations for co-creation.

Helping Italian school teachers design multilingual activities through a co-participative approach
Keywords: Bilingual Education, Cooperative/Collaborative Learning, Migrant / Refugee and Minority students, Multicultural Education
Presenting Author: Paolo Della Putta, University of Turin, Italy; **Co-Author:**Cecilia Andorno, Università di Torino, Italy; **Co-Author:**Rosa Pugliese, Alma Mater Studiorum Università di Bologna, Italy; **Co-Author:**Silvia Sordella, Università di Torino, Italy; **Co-Author:**Greta Zanoni, University of Bologna, Italy

This presentation focuses on a co-creative intervention (pilot action) using participatory approaches with teachers to enhance pluralistic approaches to multilingualism with migrant children in two Italian schools. In Italy the educational system has become increasingly multilingual; nevertheless, teachers' education and training have rarely taken into account multilingualism and multilingual competences as a base in school activities and curricula, and top-down training approaches proved to be ineffective in changing teachers' practices and beliefs in respect to pupils' multilingual repertoires. We focus here on an intervention (known as a pilot action) called '*Teacher Training and Family Involvement in Pluralistic Approaches to Language Educatioh*(TTPA), whose aim is to create conditions and activities so that multilingual skills are valued as a resource and an opportunity in the school curriculum. TTPA takes place in two schools of Turin and Forlì, two superdiverse educational contexts. The TTPA follows a co-creative planning model that has three phase 1) an the analysis of the context (questionnaires, interviews); 2) the co-creation and implementation of classroom activities led by the teachers which were observed by the research team and 3) an evaluation of the pilot action (focus groups). In this presentation we place the emphasis on the participatory process of TTPA that has proven helpful in reaching positive teacher training results. Moreover, we also critically discuss teachers' and parents' concerns and some teaching challenges encountered during the co-participative process.

Co-construction in learning settings: Unaccompanied migrant youth of 'errant' mobility
Keywords: Cooperative/Collaborative Learning, Migrant / Refugee and Minority students, Qualitative Methods, Well-being
Presenting Author: Charlotte Menin, COMBO, France

This presentation focuses on a co-creative and multi-modal intervention (known as a pilot action) that aims at reconnecting unaccompanied minors of errant mobility with education. The pilot action did this through initiation into participatory art practices that foster reflexivity, like photography, music and video-making, and through pedagogical activities that show the importance and the benefits of acquiring and sharing knowledge. This group, often hailing from the North African geographical area, is considered to be of 'errant mobilty' because they are characterized by a significant trans-European mobility, a process that leads to a nearly systematic distancing from education, which is a fundamental right of these young people, but which most of them cannot access. The pilot action took place across three workshops, each lasting approximately two weeks in the cities of Melilla, Marseille and Barcelona. The workshops involved groups of 11-14 unaccompanied 'errant' migrant young people who either lived on the street, in precarious housing (squat) or a sheltered minor's facility. Co-creative and multi-modal approaches involved activities such as music workshops, photography and other digital literacy methods. The findings detail the opportunities, challenges and barriers of setting up a pilot action with unaccompanied minors of errant mobility at both an institutional and local level. Negotiations with Local Ministries was complex and the notion of 'education' and 'school' a significant barrier to the young people's participation. In the presentation we will reflect on how the use of multi-modal methods helped to break with the top-down framework of formal education through artistic practices.

Spanish and English Proficiency of Latino Children of Immigrants to Predict Behavioral Adaptations
Keywords: Bilingual Education, Cultural Diversity in School, Multicultural Education, Social Development
Presenting Author:brian collins, Hunter College, City University of New York, United States; **Co-Author:**Claudio Toppelberg, Harvard University, United States

Given the large and growing population of Latino children of immigrants in U.S. schools, it is important to identify factors in early school years associated with their school success. Research has demonstrated the important role of children's dual language abilities in behavioral adaptation and academic success. This study investigates Spanish and English proficiencies of 228 Latino children of immigrants during the early school years. Analyses of longitudinal data from school records (K-6) and direct language assessments demonstrate Spanish and English proficiency significantly predict later academic behaviors. These findings have potential to inform educational practices and interventions that support behavioral well-being.

Session C 9

22 August 2023 17:15 - 18:45
UOM_R05
Single Paper
Assessment and Evaluation, Higher Education, Learning and Social Interaction

Collaborative Learning in Online Settings

Keywords: Attitudes and Beliefs, Competencies, Computer-assisted Learning, Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Educational Technologies, Higher Education, Learning Strategies, Peer Interaction, Problem Solving, Quantitative Methods, Social Media, Teaching/Instructional Strategies
Interest group: SIG 04 - Higher Education, SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Gillian Peiser, Liverpool John Moores University, United Kingdom

Students' collaboration dispositions across diverse online collaborative problem solving skills
Keywords: Attitudes and Beliefs, Competencies, Computer-supported Collaborative Learning, Problem Solving
Presenting Author:Päivi Häkkinen, University of Jyväskylä, Finland; **Co-Author:**Shupin Li, University of Jyväskylä, Finland; **Co-Author:**Johanna Pöysä-Tarhonen, University of Jyväskylä, Finland

Collaborative problem solving (CPS) has been considered as one of the vital 21st century skills. To be successful in CPS requires not only CPS skills but also positive attitudes towards collaboration (i.e., collaboration dispositions). However, the relationship between CPS skills and collaboration dispositions has not been studied much, especially among early adolescent students. The purpose of this study is to investigate the dimensions of students' collaboration dispositions and their relationship to assessed students' CPS skills. Data were collected from 214 Finnish sixth-grade students ($Mean_{age}$ = 12.44, SD_{age} = 0.32, female = 116, 54.21%) in 2019. Students' CPS skills were assessed based on the log file data collected from student pairs' participation in four tasks in a computer-based assessment environment. Collaboration dispositions were measured through a self-report questionnaire. Exploratory factor analysis was

applied to investigate the dimensions of students' collaboration dispositions. In addition, analysis of variance was utilised to examine the dimensions of students' collaboration dispositions across their diverse social and cognitive CPS skills. Three dimensions of students' collaboration dispositions were identified, namely negotiation, team leadership and cooperative mindset. Further, we found that the early adolescent students' CPS social skills, but not cognitive skills, were associated with their perceived collaboration dispositions. Based on our results, we argue that it is crucial to provide systematic and rigorous interventions and/or models to pay attention not only to integrating CPS skills with subject studies in schools, but also to make students aware of their collaboration dispositions.

Effects of Strategy Training & Advance Organizer in a Cooperative Online Format using Video Analysis
Keywords: Cooperative/Collaborative Learning, Higher Education, Learning Strategies, Peer Interaction
Presenting Author: Agnes Eckart, Justus-Liebig-University Giessen, Germany; **Co-Author:**Vanessa A. Völlinger, Justus-Liebig-Universität Giessen, Germany

Due to the high level of knowledge interdependence in the cooperative jigsaw method, learners rely on the explanatory skills of their group members and take a passive role in listening. We examined whether strategy training for asking questions and giving answers and an Advance Organizer (AO) could enhance students' knowledge acquisition in cooperative learning. A quasi-experimental 2x2 design (training vs. no training; AO vs. no AO) was conducted due to Covid-19 within three sessions: a pretest, a training session, and a posttest. Group work at the pretest and posttest was videotaped. A knowledge test was given at the end. No significant effects of training and AO on knowledge acquisition were found. However, there was a training effect on the number of questions asked and answers given. Those who asked more questions also performed better on the knowledge test. The initial results suggest that asking questions in cooperative online formats should be more encouraged.

A group concept mapping study on perceptions of synchronous distance education
Keywords: Computer-assisted Learning, Computer-supported Collaborative Learning, Educational Technologies, Teaching/Instructional Strategies
Presenting Author: Iwan Wopereis, Open Universiteit, Department of Online Learning and Instruction, Netherlands

Synchronous education is an important constituent of educational programs at many distance teaching universities. This paper presents a group concept mapping study (GCM) that identifies critical features of this constituent as perceived by students and teachers. The GCM data collection consisted of the generation, sorting, and rating of these features. Rating aimed at importance and feasibility. Data analysis included multidimensional scaling (MDS), hierarchical cluster analysis (HCA), and semantic analyses. Students and teachers of a DTU in Western Europe generated a 4-cluster concept map that distinguished features related to complex (group) learning, openness (inclusion), connectedness (community/enculturation), and modality (synchronous online, onsite and/or hybrid). Interestingly, the latter cluster of features was considered the least important implying that this is relatively easy to achieve in times of abundance of educational technology. Of greater importance was good instructional design where attention is paid to learning in interaction and in which every student can participate equally. Openness is an important aspect of good teaching at DTUs, and it is fortunate that the results of this GCM study support this premise.

Uncertainty Markers as Cues to Form Group Uncertainty Awareness in Online Discussions
Keywords: Computer-supported Collaborative Learning, Peer Interaction, Quantitative Methods, Social Media
Presenting Author: Lenka Schnaubert, University of Nottingham, United Kingdom; **Presenting Author:**Anna Radtke, Ruhr-University Bochum & CAIS, Germany

With the ubiquity of social learning technologies, cognitive and social functions blend when learners discuss academic topics with known or unknown peers in social media. To purposefully interact with learning partners, learners need group awareness, i.e., the salient perception of relevant aspects of learning partners or a group. However, little is known about how learners form group awareness during collaboration, what cues they use, and how they process social information. In our within-subject design study (N = 233), we varied the integration of linguistic uncertainty markers in forum discussions and measure the impact on group uncertainty awareness. To account for sequence effects, we additionally varied if learners received material with or without markers. Results show that uncertainty markers have a highly significant and positive effect on perceived group uncertainty. Another interesting effect we found was that the sequence in which markers were presented seems to play a role in the sense that learners seem to perceive the contrast between material with and without uncertainty markers more strongly when being confronted with markers first. We can thus conclude that learners are sensible towards uncertainty markers and use them as cues to form group uncertainty awareness. Additionally, the sequence effect indicates that group awareness is not only rooted within the acute social situation, but needs to be contextualized within a longer learning episode.

Session C 10

22 August 2023 17:15 - 18:45
UOM_A10
Single Paper
Instructional Design, Learning and Social Interaction

Computer-supported Collaborative Learning

Keywords: Competencies, Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Dialogic Pedagogy, Educational Technologies, Higher Education, Inquiry Learning, Pandemic, Peer Interaction, Reading, Reasoning, Simulation-based Learning, Social Interaction
Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 14 - Learning and Professional Development, SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Ariadne Warmoes, Vrije Universiteit Brussel (VUB), Belgium

Effects of stimulated reflection on collaboration in an agent-based medical simulation
Keywords: Computer-supported Collaborative Learning, Higher Education, Reasoning, Simulation-based Learning
Presenting Author: Constanze Richters, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Laura Brandl, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Matthias Stadler, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Martin Fischer, LMU University Hospital, Institute of Medical Education, Germany; **Co-Author:**Ralf Schmidmaier, LMU University Hospital Munich, Germany; **Co-Author:**Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

Collaborative diagnostic reasoning (CDR) is relevant to many professional practices. CDR involves high complex and demanding collaborative diagnostic activities (CDAs). Recent meta-analytic and experimental evidence suggests that structured reflection phases as a form of scaffolding in simulations are particularly effective in fostering such complex skills for learners with high prior knowledge due to relatively low external guidance. However, an open research question is whether a higher degree of structure of reflection can benefit learners with low prior knowledge. This study investigatesthe effects of low- and high-structured reflection addressing CDAs on CDR, considering prior knowledge in an agent-based medical simulation. Intermediate medical students (N = 195) diagnosed diseases of fictitious patients in collaboration with an agent-based radiologist. While collaboratively diagnosing, students randomly either received low-structured or high-structured scaffolding with questions, stimulating them to reflect on CDAs, or no additional support. Contrary to previous assumptions, the results showed that learners with low rather than high prior knowledge benefited from both forms of structured reflection. Low prior knowledge learners improved their CDR by reflecting on CDAs, suggesting that both forms offered sufficient guidance for these learners while they were probably redundant for more advanced learners. These findings can help to adapt reflection guidance to learners' knowledge on collaboration. This study contributes to research the moderating role of prior knowledge on the effects of reflection on the learning of complex skills. It further highlights that reflection on collaboration may be different from reflection on individual (diagnostic) reasoning and problem solving.

Effects of a collaboration script and a reflection prompt on the evaluation of Internet sources.
Keywords: Competencies, Computer-supported Collaborative Learning, Higher Education, Reading
Presenting Author: Carolin Baumgarten, Ruhr-Universität Bochum, Germany; **Co-Author:**Heiko Krabbe, Ruhr-University Bochum, Germany; **Co-Author:**Ingo Kollar, University of Augsburg, Germany; **Co-Author:**Marc Stadtler, Ruhr-University Bochum, Institute of Educational Science, Germany

When using Internet sources for informational or learning purposes, Internet users must assess the reliability of the sources used. However, since this is often difficult for them, the promotion of source evaluation skills is of great relevance. The present study was conducted in a 2x2 between-subjects-design, testing the effects of a collaboration script and a reflection prompt on the evaluation of Internet sources in a computer-based, dyadic learning setting. We expected positive effects of the collaboration script on the frequency of source evaluations in dyads' interactions, knowledge of source evaluation strategies, assessment of website reliability and self-efficacy regarding source evaluation. These effects should be particularly pronounced when the script would be accompanied by a reflection prompt that helps the internalization of the script. To test these hypotheses, *N*=118 young adults worked together in dyads on two different research tasks that involved assessing the reliability of websites. As expected, the results show more frequent source evaluations in dyads from the script condition, especially in interaction with the reflection prompt. Participants in the script condition also recalled more strategies for source evaluation than their counterparts. Here, however, the reflection prompt had no influence. Regarding the assessment of website reliability, contrary to the hypotheses, no condition-dependent differences emerged. Self-efficacy regarding source evaluations increased across all conditions from pre- to posttest. The results indicate that further research should test longer phases working with a collaboration script to ensure script internalization and larger effects on source evaluation.

Analysing educational dialogue around shared artefacts in technology-mediated contexts
Keywords: Computer-supported Collaborative Learning, Dialogic Pedagogy, Educational Technologies, Inquiry Learning
Presenting Author: Sara Hennessy, University of Cambridge, United Kingdom

This presentation explores the role that digital technology can play in mediating dialogue that is productive for learning as learners, or teachers and learners, together construct and manipulate digitally represented knowledge artefacts. It considers the methods that researchers and teachers can use to understand the learning taking place in technology-supported settings where verbal and nonverbal interactions with technology are inter-connected and entangled with activities and material learning resources. These interactions can support rich new forms of dialogue that highlight differences between participants' perspectives and make ideas and reasoning processes more explicit. The talk presents a 13-category coding scheme that can be applied at different levels of granularity (including turns and episodes) and to dialogue that may or may not have a verbal element. Application is illustrated with examples of dialogic interaction across diverse technology uses by both school-age and adult learners located in classrooms or remotely. The talk discusses the methodological issues around capturing dynamic multimodal dialogue as it unfolds in real time.

A Framework for Success of Virtual and Hybrid Collaboration: A Systematic Review
Keywords: Cooperative/Collaborative Learning, Pandemic, Peer Interaction, Social Interaction
Presenting Author: Ascha Ahmed, University of Mannheim, Germany; **Co-Author:**Viola Deutscher, University of Mannheim, Germany

Current studies indicate that workplace interactions will continue to be virtual or hybrid even after COVID-19. Given the weaknesses of such collaboration types, e.g. in knowledge sharing, trust building etc., there is a conceptual need for quality models of successful collaboration or team performance and empirical evidence on the factors for success. After systematically reviewing 448 studies, we propose an adaption or extension of existing quality models for successful collaboration/team performance in the virtual or hybrid workplace by including, among others, the leadership perspective, and the collaboration type, which have proven to be influential on the process and outcome of collaboration.

Session C 11

22 August 2023 17:15 - 18:45
UOM_A12
Single Paper
Assessment and Evaluation, Educational Policy and Systems, Teaching and Teacher Education

Democratic Citizenship Education

Keywords: Attitudes and Beliefs, Citizenship Education, Foreign and Second Language Acquisition, Metacognition, Misconceptions, Pre-service Teachers, Qualitative Methods, Quantitative Methods, Secondary Education, Social Sciences and Humanities, Vocational Education and Apprenticeship Training
Interest group: SIG 01 - Assessment and Evaluation, SIG 11 - Teaching and Teacher Education, SIG 13 - Moral and Democratic Education
Chairperson: Blanka Rósa, Sweden

What is colored in and what is colored out? Democracy training in vocational programs
Keywords: Citizenship Education, Qualitative Methods, Secondary Education, Vocational Education and Apprenticeship Training
Presenting Author: Linda Ekström, Political science, school of social sciences, Sweden

In 2019, 48.4 % of the upper secondary pupils in the EU attended a vocational program. According to the ICCS results, these students have lower scores in civic capacities and are therefore in need of high-quality democracy training. In Sweden, however, the trend has been the opposite. These students receive few teaching hours in civics and meet a limited civics' syllabus. Further on, civics teachers in vocational program are also required to integrate theory and practice in their civics teaching; they are supposed to link the future work of their vocational students to the civics teaching. This instructional strategy is in Sweden referred to as a *coloring practice.* How does this instructional approach tend to strengthen or challenge the democracy training of these students? What is colored in and what is colored out in the strive to integrate theory and practice in civics teaching in vocational programs? Are certain themes more easily integrated in relation to the future work of these students while others are left behind? In this discourse analytical study, I have interviewed 16 civics teachers in vocational programs about their work with coloring practices. The results show that this instructional strategy tend to further increase an ongoing tendency to deprioritize democratic training within the vocational program. For example, while issues regarding private economy and the labor market are easily connected to the vocational students working context, issues such as human rights and democracy is neglected since they are difficult to connect to vocational students' future professions.

Rehearsing Teacher-in-Role: a Door Opener for Intercultural Learning and Democratic Citizenship?
Keywords: Citizenship Education, Foreign and Second Language Acquisition, Metacognition, Pre-service Teachers
Presenting Author: Michel Cabot, Western Norway University of Applied Sciences, Norway; **Co-Author:**Gunn Tone Iversen, Western University of Applied Sciences, Norway

Norway's latest curriculum points to a connection between intercultural learning and democratic citizenship. However, both internationally and nationally, there is little research on how democratic citizenship can be promoted through intercultural learning in primary school teacher education in English as a foreign language. This qualitative case study analyses student teachers' reflections on how process drama, more specifically teacher-in-role based on Roald Dahl's novel Matilda, can promote intercultural learning and democratic citizenship. It was conducted as part of the research project "Rehearsing Teaching Professionally", funded by the Norwegian Council of Research. It draws on McDonald et al.'s (2013) concept of rehearsing during four different phases on campus and in practice schools. The main research question is: how can student teachers use teacher-in-role based on Roald Dahl's novel Matilda to promote their own intercultural learning and democratic citizenship? This longitudinal study is based on video observations, obligatory assignments, video-stimulated recall interviews and term papers written by six student teachers throughout their first semester at a Norwegian teacher training college. To analyse the data, we integrated diverse definitions of intercultural competence (e.g, Deardorff, 2006) and Byram's (2008) "savoir" concepts into a new model. The findings suggest that well-planned "critical incidents" (e.g. Butterfield et al., 2005) may lead to intercultural learning (e.g. self-monitoring and decentering as internal outcome) and democratic citizenship (e.g. empathy as external outcome). This study emphasises the importance of rehearsing teacher-in-role as a method to strengthen intercultural learning and democratic citizenship and develop critical intercultural citizenship in EFL teacher education.

Economics as elective subject – How do students with the subject economics differ from others?
Keywords: Citizenship Education, Quantitative Methods, Secondary Education, Social Sciences and Humanities
Presenting Author: Lucy Haag, University of Tübingen, Germany; **Co-Author:**Luis Oberrauch, University Tuebingen, Germany

Facing globalized markets and rapidly changing economic landscapes, economic education becomes increasingly important to make well informed and

thoughtful decisions, for instance, regarding financial matters. However, teaching economics is also criticized. One reason for that is the possible influence of students towards a more egocentric, profit-maximizing attitude. Two different theories, self-selection and indoctrination, can be used to explain why economics students might behave differently than other individuals. The indoctrination hypothesis states that economics teaching encourages students to adjust their attitudes towards orthodox economic theory, whereas self-selection assumes that students possess certain traits already before studying economics.This article investigates whether a selection effect exists, whereby German students with different demographic characteristics, preferences, personality traits, or normative attitudes may self-select themselves into economics at the secondary school level. Our data shows that besides neuroticism as the only personality trait as well as gender and two out of four normative attitudes, no other variables show significant correlations. In conclusion, results do not meet expectations of economists being less altruistic, as no difference between students who select economists and other individuals is evident regarding preferences. Results contribute both to the scientific discussion. They also inform the current debate on the implementation of mandatory economic education in Germany and other countries.

Do I Need to Know the Unemployment Rate? Connecting Knowledge to Welfare Attitudes via Deservingness
Keywords: Attitudes and Beliefs, Citizenship Education, Misconceptions, Secondary Education
Presenting Author: Jakub Sowula, University of Teacher Education Berne, CH// University of Tuebingen, GER, Switzerland

Forming elaborate welfare attitudes is a crucial political task for democratic citizens, requiring key democratic competencies such as civic-mindedness and knowledge and critical understanding of one's political surroundings. Formal education ideally assists students in becoming democratically and politically competent citizens. However, there is a lack of theoretically founded empirical research aiming to find out what information could be beneficial for students in their processes of democratic competencies development. This study contributes to filling this gap by investigating Swiss secondary school students' (N=1061, 8th/9th-grade) unemployment-related knowledge and welfare attitudes via the welfare deservingness heuristic through an online survey. Deservingness describes the extent to which target groups are seen as worthy of receiving social welfare. It is a strong determinant of welfare attitudes, and previous research with adults showed that it is influenced by peoples' welfare-state-related misinformation. Deservingness research could thus help detect information educators can thematise in formal education. However, it is unclear if youth also rely on deservingness thinking in welfare attitude formation and whether (not) knowing specific information is related to their deservingness assessments. The study displays mixed results regarding the knowledge items. While the students are aware of some aspects (e.g., lower spending on unemployment than on other social policy areas), they strongly overestimate the unemployment and fraud rates. However, only the fraud rates are significantly related to their deservingness assessments. Moreover, students' deservingness assessments are strongly related to their welfare attitudes (e.g., benefit generosity). Implications of results and recommendations for educational practice and political education are discussed.

Session C 12

22 August 2023 17:15 - 18:45
AUTH_DC1
Single Paper
Learning and Instructional Technology, Teaching and Teacher Education

Mathematics Teachers: Instructional Strategies and Competencies

Keywords: Attitudes and Beliefs, Cognitive Skills and Processes, Conceptual Change, Early Childhood Education, Learning Strategies, Mathematics/Numeracy, Pre-service Teachers, Primary Education, Qualitative Methods, Self-regulated Learning and Behaviour, Teacher Professional Development, Teaching Approaches, Teaching/Instructional Strategies
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 11 - Teaching and Teacher Education, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Gemma O'Sullivan, Netherlands

Conceptions of functional thinking of mathematics educators: an international interview study
Keywords: Attitudes and Beliefs, Mathematics/Numeracy, Qualitative Methods, Teacher Professional Development
Presenting Author: Kerstin Frey, Ludwigsburg University of Education, Germany; **Presenting Author:**Ute Sproesser, PH Ludwigsburg, Germany; **Co-Author:**Martina Geisen, University of Koblenz - Landau, Germany; **Co-Author:**Veronika Hubeňáková, Pavol Jozef Šafárik University in Košice, Slovakia; **Co-Author:**Monika Krišáková, Pavol Jozef Šafárik University in Košice, Slovakia; **Co-Author:**Nowińska Edyta, Universität Osnabrück, Germany; **Co-Author:**Marios Pittalis, University of Cyprus, Cyprus; **Co-Author:**Miroslawa Sajka, Pedagogical University of Krakow, Poland; **Co-Author:**Michiel Veldhuis, Hogeschool IPABO Amsterdam/Alkmaar, Netherlands

Functional thinking is a key element of mathematics education, but also plays an important role outside of the classroom in everyday life. It is for example required when relating two quantities like distance and time (extra-mathematical) or to describe the relationship between *x* and *y* in a given function (intra-mathematical). To deal with such relationships, mathematical prerequisites, like for example understanding variables and symbols, are also crucial for functional thinking. However, for the development of functional thinking, various curricula highlight the importance of using extra-mathematical contexts. Such different entailments of functional thinking and a variety of corresponding definitions might lead to different conceptions among mathematics educators which can result in different teaching practices and consequently in heterogeneous student learning. More concretely, for educators, the needed mathematical prerequisites might suggest an intra-mathematical focus in their teaching of functional thinking while omitting extra-mathematical contexts. In this study, 34 expert interviews were conducted in five European countries to collect mathematics educators' conceptions of functional thinking. The results were analyzed using qualitative content analysis. This paper focuses on these mathematics educators' conceptions of using functional thinking in intra- and extra-mathematical contexts and necessary mathematical prerequisites. In line with the literature, the results emphasize the importance of using extra-mathematical contexts for developing functional thinking but also the relevance of mathematical prerequisites. The findings suggest to address such mathematical prerequisites for functional thinking when dealing with extra-mathematical contexts. These results are intended to inform pre- and in-service teachers in order to support their students' functional thinking.

Examining the effect of a deep lecture notetaking intervention on mathematics deeper understanding
Keywords: Cognitive Skills and Processes, Learning Strategies, Mathematics/Numeracy, Self-regulated Learning and Behaviour
Presenting Author: Mengsi Liu, The University of Tokyo, Japan; **Co-Author:**Yuri Uesaka, The University of Tokyo, Japan

In this experiment, we examined whether the intervention on deep lecture notetaking, intentionally taking cognitive and metacognitive contents, fosters a deeper understanding in math class. The effectiveness of encouraging students to take notes directly on the textbook was also measured in terms of the cognitive load required for notetaking. High school students (N = 94) were randomly assigned to four groups. This experiment had a 2×2 factorial design with between-subject factors deep notetaking strategy (intervention or no intervention) and medium for notetaking (textbook versus notebook). A two-way ANOVA revealed a significant main effect (partial $\eta 2 = .10$) for the deep notetaking instruction, yet neither the medium nor interaction effects yielded significant results. This study verified that teaching students deep notetaking strategies improve a deeper understanding of math classes. The findings of this study may shed light on how to cultivate lecture notetaking strategies among students for enhanced learning in educational settings.

Early childhood education: Understanding mathematics teachers' diagnostic competence
Keywords: Early Childhood Education, Mathematics/Numeracy, Primary Education, Teacher Professional Development
Presenting Author: Maike Hagena, University of Hamburg, Germany; **Co-Author:**Michael Besser, Leuphana University of Lüneburg, Germany

School beginners have a variety of numerical skills, which are also referred to as early numerical competencies. These early numerical competencies are considered essential for the development of later mathematics competencies. Accordingly, to be able to support school beginners in their individual development processes from the very beginning, teachers must first obtain an overview of the early numerical competencies of school beginners. For this, teachers need diagnostic competence in the field of early numerical competencies. Therefore, evidence-based professional development supporting teachers in

building up such diagnostic competencies for the assessment of early numerical competencies of school beginners is necessary. Aiming at designing, implementing and evaluating such a professional development concept, a qualitative preliminary study was conducted. Within this study twelve primary school mathematics teachers were interviewed regarding their knowledge of early numerical competencies, of diagnostic instruments, and of supportive organizational structures for the successful implementation of diagnostics in the school entry phase. Results and implications of this study are reported below.

Mathematics teacher educators as a role model: What do preservice teachers learn about it?
Keywords: Pre-service Teachers, Primary Education, Qualitative Methods, Teaching Approaches
Presenting Author: Helena Montenegro, Universidad de Chile, Chile; **Co-Author:**Salomé Martínez, Universidad de Chile, Chile; **Co-Author:**Flavio Güíñez, Universidad de Chile, Chile

Mathematics teacher educators play a crucial role as models for preservice teachers: they impact the student teachers' perspectives of teaching mathematics through their teaching practices. Hence, researching this role as a model becomes crucial since it is a medium that can enhance mathematics teacher education. However, modeling effective teaching practices do not ensure that preservice teachers can learn and apply them in their own teaching. Therefore, it is fundamental to inquire about what preservice teachers learn and think when they are experiencing the process of learning to teach mathematics. Their insights, learning, and point of view are valuable information for improving and aligning teaching and learning processes inside teacher education programs. This study aims to understand the mathematics teacher educators' role models from the preservice teacher perspective. For that, we inquired what prospective teachers look at and scrutinize when the mathematics teacher educator is teaching about teaching. Data was collected through focus groups when participated forty-eight preservice teachers from seven Chilean primary school preservice teacher education programs, and the focus groups were analyzed using thematic analysis. Results showed that preservice teachers highlighted four main issues related to the mathematics teacher educators' role as models: (1) personal attributes expected from a teacher; (2) instructional practices carried out; (3) the experience of a congruent teaching approach; and (4) the teaching practices that they do not want to perform when they become teachers. These findings have implications for both practice and future research.

Assessing Conceptual Change around Reform-Based Math Practices in Ghanaian Pre-Service Teachers
Keywords: Attitudes and Beliefs, Conceptual Change, Pre-service Teachers, Teaching/Instructional Strategies
Presenting Author: Dionne Cross Francis, University of North Carolina at Chapel Hill, United States; **Co-Author:**Pavneet Kaur Bharaj, University of North Carolina, United States; **Co-Author:**Kathryn Habib, University of North Carolina at Chapel Hill, United States; **Co-Author:**Anna Hinden, University of North Carolina, United States; **Co-Author:**Anna Gustaveson, University of North Carolina at Chapel HIll, United States

Teachers' beliefs related to teaching and learning mathematics are highly connected to the practices they use in the classroom. We combined the beliefs-first and practice-first approach as we designed an 8-week secondary mathematics course for Ghanaian pre-service teachers. Employing both problem-solving practices and refutation texts allowed us to observe shifts in PSTs' opinions related to reform-oriented beliefs using the open-ended self-designed questionnaire. Findings suggest promise in using interventions that combine beliefs-first (refutation texts) and practice-first (reform-based learning experiences) approaches while working on PSTs' beliefs. The study also points out the importance of examining the cultural context of teacher beliefs and implications for future work on teacher development.

Session C 13

22 August 2023 17:15 - 18:45
UOM_A07
Single Paper
Motivational, Social and Affective Processes

Achievement Goal Theory: Classroom Goal Structures and Student Goals

Keywords: Assessment Methods, Goal Orientations, Higher Education, Mixed-method Research, Motivation, Peer Interaction, Quantitative Methods, Science Education, Social Aspects of Learning and Teaching, Social Interaction
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Inge Van der weijden, Leiden University, Netherlands

Exploring Classroom Goal Structures Based on Students' Own Words
Keywords: Goal Orientations, Mixed-method Research, Motivation, Peer Interaction
Presenting Author:József Balázs Fejes, University of Szeged, Hungary

Achievement goal theory research has identified a number of factors that can help to create a positive climate in terms of motivation. Research within this framework related to environmental factors has mainly focused on teachers' practices, usually from a deductive perspective. However, this appears to hinder a fuller understanding of all the factors that influence students' perceptions of the classroom goal structures. Therefore, using a combination of inductive and deductive approaches, a series of three studies were conducted to identify new elements in students' perceptions of the classroom goal structures in relation to mathematics. In Study 1 (n = 340, 5th–7th graders), a self-reporting Hungarian-language questionnaire was developed to measure classroom goal structures. In Study 2 (n = 250, 7th graders), this questionnaire was supplemented with open-ended questions about the classroom climate. Based on a qualitative analysis of these open-ended questions, new scales related to the social elements of the classroom (helping peers, recognition by peers, and image of the classroom community) were created in Study 3 (n = 438, 6th–8th graders) to explore their relationship to classroom goal structures. Factor analysis confirmed the expected structure, except for recognition by peers, which had to be divided into two factors, with the new construct known as teasing peers. Findings confirm the relevance of a combined, inductive–deductive approach in examining classroom goal structures.

Momentary Achievement Goal Profiles: Associations with Learning Activities, Interest, and Anxiety
Keywords: Goal Orientations, Motivation, Quantitative Methods, Science Education
Presenting Author: Junlin Yu, University of Helsinki, Finland; **Co-Author:**Jussi Järvinen, University of Helsinki, Finland; **Co-Author:**Veli-Matti Vesterinen, University of Helsinki, Finland; **Co-Author:**Katariina Salmela-Aro, Helsinki University, Finland

Although students' achievement goals are thought to be contextually sensitive, they are typically measured as stable individual orientations. In addition, students often pursue multiple goals simultaneously rather than one at a time. To capture the dynamic nature of achievement goal pursuit, this study combined momentary assessments and pattern-centered analyses to identify students' momentary achievement goal profiles. It also examined the role of learning activities (e.g., listening to lectures, group work) in predicting profile membership, and how these profiles were associated with interest and anxiety. A total of 1507 responses were collected from 140 upper secondary school students in science classes via experience sampling method. Latent class analyses revealed three momentary achievement goal profiles: Moderate Mastery Goals (25%), Moderate All Goals (48%), and High All Goals (27%). Group work predicted an increased likelihood of experiencing High All Goals. Moreover, the High All Goals profile was associated with higher situational interest than Moderate Mastery Goals and Moderate All Goals profiles. The findings underscore the importance of studying situational goal profiles in addition to stable goal orientations.

Investigating Cheating in the Lab: Effects of Performance Goals and Evaluation Focus
Keywords: Assessment Methods, Goal Orientations, Higher Education, Motivation
Presenting Author: Tanja Fritz, University of Augsburg, Germany; **Co-Author:**Hernán González Cruz, University of Mannheim, Germany; **Co-Author:**Stefan Janke, University of Mannheim, Germany; **Co-Author:**Martin Daumiller, University of Augsburg, Germany

Wanting to be perceived as competent is considered an important motivation for academic cheating behavior (Anderman & Koenka, 2017). However, while theoretically reasonable, performance goals frequently do not directly translate into cheating behavior (e.g., Daumiller & Janke, 2020; Krou et al., 2021), which could be due hitherto unexplored aspects of the performance task itself. We present a preregistered experiment on the moderating effect of the evaluation focus (result vs process) on the relationship between performance goals and cheating behavior (N = 238, number of semesters: M = 4.5, SD = 1.8, 67.0% female,

1.3% diverse). Participants worked on various tasks under four conditions (factor 1: performance goal induction vs no induction; factor 2: result v. process focused evaluation). Cheating behavior was measured as indicating having solved an actually unsolvable task, as well as observed behavior in the form of unauthorized aids (e.g., internet research). Performance goals had a significant main effect on observed cheating (25.5% in goal-induction groups vs 15.8% in no-goal-induction groups, p = .041, OR = 1.79), but were not significantly moderated by the evaluation focus. However, the evaluation focus showed a significant main effect in reporting having solved an unsolvable task (44.6% result-focus groups vs 31.6% process-focus groups, p = .017, OR = 1.78). An optimal task design, which is easier to influence than personal goals, could therefore be an effective lever to counteract cheating behavior. Based on our findings, we discuss strengths and weaknesses of the experimental design and methodological implementations in research on academic cheating.

Relationships Between Students' Achievement Goals and Social Network Centrality in the Classroom
Keywords: Motivation, Peer Interaction, Social Aspects of Learning and Teaching, Social Interaction
Presenting Author: Alla Hemi, Bar Ilan University, Israel; **Co-Author:**Nir Madjar, Bar-Ilan University, Israel; **Co-Author:**Yisrael Rich, Bar Ilan University, Israel; **Co-Author:**Martin Daumiller, University of Augsburg, Germany

Achievement goals matter for important student outcomes, including their well-being, collaboration with peers and academic achievement. Theory and research also indicate that achievement goals are related to students' social context. Considering that interaction with peers is a key part of the everyday school context, peer relationships should also be relevant for students' achievement goals. Given the sparse research on this topic, we examined relationships between students' achievement goals and their role in social networks. Specifically, we hypothesized that mastery-approach goals are positively associated, and performance-avoidance goals are negatively associated with social network centrality in the classroom. Multilevel social network analyses of 472 high-school students (52% female; Mage = 15.71) from 23 classrooms revealed that mastery-approach goals were positively associated with outdegree, closeness and betweenness centrality measures, while a negative association emerged between performance-avoidance goals and indegree centrality. Interestingly, students' performance-avoidance goals were negatively associated only with indegree, while the correlation between performance-avoidance and outdegree was positive. It is possible that students with enhanced performance-avoidance goals might be trying to engage in more social interactions with their peers, but these attempts seem to be ineffective. These findings help illustrate the role of achievement goals for students' social positioning in the classroom, helping to inform interventions to support both adaptive achievement goals and central social positioning in the classroom.

Session C 14

22 August 2023 17:15 - 18:45
AUTH_TE2
Single Paper
Cognitive Science, Instructional Design, Teaching and Teacher Education

Learning Mathematics in Primary Education

Keywords: Cognitive Development, Cognitive Skills and Processes, Competencies, Early Childhood Education, Eye Tracking, Instructional Design, Mathematics/Numeracy, Pre-service Teachers, Primary Education, Teaching/Instructional Strategies
Interest group: SIG 06 - Instructional Design, SIG 09 - Phenomenography and Variation Theory, SIG 11 - Teaching and Teacher Education
Chairperson: Katja Scharenberg, University of Education Freiburg , Germany

Learning spurious associations from mathematics textbooks: A replication and extension study
Keywords: Instructional Design, Mathematics/Numeracy, Primary Education, Teaching/Instructional Strategies
Presenting Author: Lennart Schalk, PH Schwyz, Switzerland; **Co-Author:**Parvaneh Babari, Pädagogische Hochschule Schwyz, Switzerland; **Co-Author:**Bruno Rütsche, Schwyz University of Teacher Education, Switzerland

Understanding and doing algorithmic operations with rational numbers (e.g., fractions, decimals) is among the most important, but also the most difficult topics children encounter during primary school mathematics education. To explain the source of such difficulties, Braithwaite and Siegler (2018) provided evidence that children learn spurious, mathematically irrelevant associations between fraction arithmetic operations and operand features, which arise from the unbalanced and non-random distribution of the arithmetic tasks in mathematics textbooks. We replicated Braithwaite and Siegler's investigation on fraction arithmetic by analysing Swiss elementary school mathematics textbooks and testing 105 sixth graders. Moreover, we extended their study by including decimal arithmetic, too. We observed that Swiss mathematics textbooks also show unbalanced distributions of arithmetic tasks and that Swiss students learn mathematically irrelevant associations both between fraction and decimal arithmetic operations and operand features that parallel these distributions. Our results are thus consistent with Braithwaite and Siegler's (2018) results. We discuss the implications of our findings for educational practice, especially focussing on the potential drawbacks of forming such spurious associations.

Learning through space: spatializing information as a determinant of academic skill development
Keywords: Cognitive Development, Cognitive Skills and Processes, Mathematics/Numeracy, Primary Education
Presenting Author: Jolien Moorkens, UGENT, Belgium; **Co-Author:**Jean-Philippe van Dijck, Thomas More University College, Belgium; **Co-Author:**Wim Fias, UGENT, Belgium

Numbers are known to be mentally represented as a mental number line (MNL). Recently, it has been discovered that also series of items in working memory are spatially represented as positions on a line (Working Memory Line, WML; van Dijck et al., 2011). It is still unknown how these spatial representations develop and how they relate to the acquisition of academic skills like mathematics or reading and writing. In a large cross-sectional study in 547 children from third and fifth grade we tested the degree of spatialization of number and working memory representations and correlated these measurements with scores on standardized reading, spelling and math tests. The results of this study show that the MNL and the WML don't develop simultaneously: children who use space in a number task, don't necessarily use space in a working memory task. The independence of the two types of spatialization is also reflected in the relations with academic skills. Whereas there is no relation at all in third grade, the results show that, from fifth grade on, having a MNL is associated with good mathematical skills, while having a WML seems to be more related to good spelling skills. Possible implications for education and instruction will be discussed.

Benefits of errors: Noticing young learners' mathematical thinking through confusions and mistakes
Keywords: Eye Tracking, Mathematics/Numeracy, Pre-service Teachers, Primary Education
Presenting Author: Fanni Biró, University of Szeged, Doctoral School of Education; MTA-SZTE Metacognition Research Group, Hungary; **Co-Author:**Csaba Csíkos, University of Szeged, MTA-SZTE Metacognition Research Group, Hungary; **Co-Author:**Judit Szitányi, ELTE Eötvös Loránd University, Hungary

Noticing – as an important component of teacher expertise – has received remarkable attention in the past decades on an international level, however, Hungarian teacher education has yet to build on the accumulated theoretical and empirical results. Our aim was to conduct an exploratory case study on the noticing of elementary students' mathematical thinking through errors and confusions during mathematics lessons in a country where teacher education does not take into consideration the international literature of noticing, and where recording pre- or in-service teachers' lessons is not a common practice. The results indicate that only teacher educators reached Focused and Extended Noticing Levels, while in-service and prospective teachers cycled back and forth between Baseline and Mixed Noticing Levels. Our findings suggests that renewal of Hungarian elementary teacher education by means of incorporating noticing as a valuable teacher competence should be built on empirical results that take account of both international developments and local traditions. The current results show that there is much place for progression, and the benefits of errors and confusions appear not only in children's thinking, but in teachers' video-based noticing as well.

Assessing second grader's proportional vocabulary and proportional reasoning abilities
Keywords: Cognitive Development, Early Childhood Education, Mathematics/Numeracy, Primary Education
Presenting Author: Karen De Keersmaeker, KU Leuven, Belgium; **Co-Author:**Elien Vanluydt, KU Leuven - University of Leuven, Belgium; **Co-Author:**Patrick

Onghena, KU Leuven, Belgium; **Co-Author:**Wim Van Dooren, KU Leuven, Belgium

Proportional reasoning, or the reasoning about the relationship between two ratios is omnipresent in our lives. As the relationship between two ratios can also be expressed through words such as *half* and *three times more*, proportional reasoning might have a linguistic aspect. We examined whether second graders' proportional reasoning abilities were associated with their proportional vocabulary knowledge, or their understanding of proportional reasoning vocabulary words. Due to the absence of a proper proportional vocabulary task in the early elementary grades, our first step consisted of developing one. In a later step, this instrument was, together with a task tapping proportional reasoning abilities, administered to 145 second graders. The results showed a correlation between second graders' proportional vocabulary understanding and proportional reasoning abilities. Moreover, proportional vocabulary was still a unique predictor for proportional reasoning abilities after controlling for gender, age and socio-economic status. Our study confirms the importance of mathematical vocabulary for mathematical achievement. It is advised for future research to examine if enhancing proportional vocabulary in young children improves proportional reasoning.

6-yearolds' structural awareness and arithmetic skills
Keywords: Cognitive Skills and Processes, Competencies, Mathematics/Numeracy, Primary Education
Presenting Author: Camilla Björklund, University of Gothenburg, Sweden; **Co-Author:**Angelika Kullberg, University of Gothenburg, Sweden

To develop successful arithmetic skills, it is assumed that students need to learn about numbers' part-whole relationship and how to make use of such relations in arithmetic problem solving. The aim of this study is to explore in what ways 6-yearolds experience numbers' cardinality when arranged in structured sets, as a prerequisite for arithmetic skills. The specific research question is how different ways of seeing numbers' structural features are related to the ability to determine cardinality. Task-based interviews were done with 289 6-yearolds at the beginning of their first compulsory school year. The aim of the interviews was to capture their ways of seeing numbers' structural features before formal education in arithmetic strategies. The task chosen for analysis captures the students' ways to solve tasks asking for how they identified the number of objects in a canonical pattern (six dots in a triangle shape). Variation theory of learning was used as a theoretical framework to analyze how students experienced the group of objects. The analysis focused on how the students identified the quantity as a structured set of objects, and how they made use of any identified structure to determine the exact number of dots. 40% of the students were able to identify some kind of structured sets. A qualitative interpretation indicates that students may discern quantities as composed units but do not necessarily discern the relationship of the units being parts of a larger whole and therefore cannot determine the number of dots without having to use single-unit counting.

Session C 15

22 August 2023 17:15 - 18:45
AUTH_DC3
Single Paper
Cognitive Science, Learning and Instructional Technology, Teaching and Teacher Education

Using Immersive Technologies for Learning and Assessment

Keywords: Assessment Methods, Goal Orientations, Immersive Technologies for Learning, Informal Learning, Instructional Design, Mixed-method Research, Pre-service Teachers, Quantitative Methods, Science and STEM, Vocational Education and Apprenticeship Training
Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 14 - Learning and Professional Development
Chairperson: Fatou-Maty Diouf, University of Geneva, Switzerland

Instruction of Reception Goals as a Method to Direct the Processing of Uncertain Information
Keywords: Goal Orientations, Immersive Technologies for Learning, Informal Learning, Quantitative Methods
Presenting Author: Stefanie Aberle, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Manuela Glaser, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Stephan Schwan, Leibniz-Institut für Wissensmedien, Germany

Based on the model of processing evidence and its uncertainty values, previous research has shown that there is a bias to process certain and neglect uncertain information (Glaser et al., 2022). The present paper examines whether instructing particular reception goals can avoid this bias and direct information processing in order to provide learners with an understanding of the evidential nature of the learning content, and at the same time have them elaborate on particular contents, irrespective of their status of scientific uncertainty. Participants were assigned either a learning goal or a research goal. They were then presented a desktop virtual reality reconstruction of a historic building which included architectural elements of different degrees of uncertainty. Uncertainty was expressed both visually by stop light colours and verbally in accompanying audio explanations. Retention of the appearance of architectural elements, the uncertainty values, and their verbal scientific justifications were measured in both reception goal conditions. Results showed that with a learning goal, the appearance of certain elements was better retained than the appearance of uncertain elements, whereas with a research goal, the appearance of architectural elements was similarly retained across all elements. The retention of uncertainty values and their verbal scientific justifications was similar for uncertain, medium, and certain elements in both goal conditions. The study extends existing theories by showing that goal setting can change the processing of uncertain information and that orchestrating basic characteristics of learning technologies with carefully chosen instructional strategies is especially important for learning material containing uncertain information.

Using VR to Train Situation Awareness in Road Construction Operators: The Effect of Debriefing
Keywords: Immersive Technologies for Learning, Mixed-method Research, Science and STEM, Vocational Education and Apprenticeship Training
Presenting Author: Ilona Friso-van den Bos, University of Twente, Netherlands; **Co-Author:**Bas Kollöffel, University of Twente, Netherlands

Road construction operators need a strong sense of what is going on around them, a skill termed Situation Awareness (SA). With Virtual Reality technology, it becomes possible for students to train their SA before facing a real-life work situation. In this study we tested a recently developed VR training for the acquisition of SA in asphalting education to assess whether students show progress in their SA performance, and whether variation in learning gains was a function of debriefing. Participants were 55 students from vocational engineering education who took part in four VR sessions aimed at compaction. SA was tested using queries at the end of each session. Participants were distributed over three conditions: a group receiving feedback in a debriefing session with video playback, a group receiving a debriefing without video playback, and a group with no debriefing. Results showed that there was growth in Situation Awareness acuity during the training, which can be fully attributed to a sharp incline in scores between the first two sessions. There was no difference in gains between students taking part in various conditions, from which it can be concluded that debriefing did not propagate gains in performance. Recommendations for future research include an investigation of the roles of expertise and motivation, while practical recommendations include developing the VR to include more interactive elements.

Methodological challenges in evaluating the potential of Virtual Reality for classroom management
Keywords: Assessment Methods, Immersive Technologies for Learning, Instructional Design, Pre-service Teachers
Presenting Author: Jolien Mouw, University of Groningen, Netherlands; **Co-Author:**Marjon Fokkens-Bruinsma, University of Groningen, Netherlands

Our qualitative study has shown that second-year PSTs greatly appreciate our VR-kindergarten classroom as a didactical tool to develop CMS. However, validly capturing VR-supported overtime CMS development and empirically evaluating the added value of our VR kindergarten poses major methodological challenges, for example, regarding which assessment methods are best suited to measure VR-supported over-time development of multifaceted skills and the unsuitability of traditional instruments to gauge PSTs' conscious observations of disruptive behaviors. Using data collected at different time points and through different research designs, we will exemplify the methodological challenges we encountered and discuss what we can(not) learn from and discuss what we can (not) conclude from our findings.

Session C 16

22 August 2023 17:15 - 18:45

UOM_CR
Single Paper
Learning and Instructional Technology, Learning and Social Interaction, Lifelong Learning

Supporting Self-regulated Learning and Behaviour with Technology

Keywords: Comprehension of Text and Graphics, Computer-assisted Learning, E-learning/ Online Learning, Educational Technologies, Metacognition, Mixed-method Research, Multimedia Learning, Pandemic, Primary Education, Secondary Education, Self-regulated Learning and Behaviour, Teaching/Instructional Strategies
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Silke Hertel, Ruprecht-Karls-Universität Heidelberg, Germany

Predicting self-regulated learning support needs during learning
Keywords: Computer-assisted Learning, E-learning/ Online Learning, Educational Technologies, Self-regulated Learning and Behaviour
Presenting Author: Rick Dijkstra, Radboud University Nijmegen, Netherlands; **Co-Author:**Max Hinne, Radboud University, Netherlands; **Co-Author:**Eliane Segers, Radboud University, Netherlands; **Co-Author:**Inge Molenaar, Radboud University, Netherlands

When children learn using Adaptive Learning Technologies, these technologies take over their ability to self-regulate their learning. This results in children learning less self-regulated learning (SRL) skills. To build a system that supports children to engage in SRL, it first is necessary to assess their support needs. Therefore, we identify what level of SRL support children need *after learning*, based on clustering trace data from the learning technologies. Subsequently, we predict what level of SRL support children need *during learning* by determining to which cluster they belong while they are making exercises. We identified nine different clusters, which, when interpreted on learning and SRL behaviour metrics, map to four different levels of SRL support needs. While predictions at chance level give an accuracy of 11%, they are accurate 38% of the times after the first set of 12 exercises and improve up to 90% after 53 problems. These results demonstrate that it is possible to identify support needs *during learning*.

Monitoring in Multimedia Learning: Does Monitoring one's Learning Process Affect Learning?
Keywords: Comprehension of Text and Graphics, Metacognition, Multimedia Learning, Self-regulated Learning and Behaviour
Presenting Author: Emely Hoch, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Katharina Fleig, Leibniz-Institut für Wissensmedien (IWM) | Knowledge Media Research Center, Germany; **Co-Author:**Katharina Scheiter, University of Potsdam, Germany

The ability to control one's own learning process plays an important role in learning, especially in multimedia learning, where learners often rely on a multimedia heuristic (i.e., overconfidence). We investigated whether explicitly monitoring, that is, reflecting and evaluating one's learning process, affects overall monitoring accuracy and learning performance. Results showed that in line with the multimedia heuristic, learners were overconfident about their level of learning; learners who were instructed to monitor their learning process, though, were pretty accurate about their level of learning. There was no significant difference in learning performance for participants who monitored or did not monitor their learning process. However, the relation of monitoring and performance was mediated by subsequent learning behavior. The results suggest that monitoring improves metacognitive accuracy and that learning outcomes might be improved by regulating subsequent learning behavior.

The promotion of self-regulated Learning: A video-based classroom study
Keywords: Metacognition, Mixed-method Research, Secondary Education, Teaching/Instructional Strategies
Presenting Author: Amina Rosenthal, University of Applied Sciences Northwestern Switzerland, Switzerland; **Co-Author:**Carmen Nadja Hirt, University of Zurich, Switzerland; **Co-Author:**Johannes Jud, University of Zurich, Switzerland; **Co-Author:**Tabea Daria Eberli, University of Applied Sciences and Arts Northwestern Switzerland PH (FHNW), Switzerland; **Co-Author:**Yves Karlen, University of Zurich, Switzerland

Self-regulated learning (SRL) is an important educational goal as it supports students to become successful lifelong learners. Teachers play a crucial role in developing their students' SRL. However, still little is known about how teachers at the lower secondary levels promote SRL in their classes and which professional competences influence teachers' SRL promotion. Video-based classroom observations of $N = 54$ lower secondary teachers were conducted to assess their direct and indirect promotion of SRL. In addition, teachers' knowledge and beliefs about SRL were assessed using knowledge tests and an online self-report questionnaire. The results of this mixed-method study revealed that teachers lacked content knowledge about metacognition and had an average level of pedagogical content knowledge about SRL. Further, teachers reported having consistent beliefs about SRL. Regarding the promotion of SRL, the results revealed that teachers promoted SRL mainly implicitly and less often directly. Implications for teachers' professional training programs emerge from the findings: They could benefit from learning about explicit instruction of SRL and becoming more familiar with the concept of metacognition.

Promoting self-regulation during the COVID-mandated home-schooling period – Insights from interviews
Keywords: E-learning/ Online Learning, Pandemic, Primary Education, Self-regulated Learning and Behaviour
Presenting Author: Rutmer Ebbes, University of Amsterdam, Netherlands; **Co-Author:**Jaap Schuitema, University of Amsterdam, Netherlands; **Co-Author:**Marjolein Zee, Erasmus University Rotterdam, Netherlands; **Co-Author:**Brenda Jansen, University of Amsterdam, Netherlands; **Co-Author:**Helma Koomen, Research Institute of Child Development and Education, Netherlands

For prolonged stretches of time in 2020 and 2021 Dutch primary schools were closed due to Covid-19. During this time, children received education at home in an online format. In the current study we aimed to get more insight into the problems Dutch primary school teachers faced when supporting children's self-regulation during the Covid lockdowns. Moreover, we investigated what different approaches teachers used to support self-regulation during this time. To this end, we interviewed ten primary school teachers (M_{age} = 36.8 year, SD = 9.7, 90% females) teaching in grades 3 - 8. Teachers mentioned several main challenges of the Covid-mandated home-schooling period. Most mentioned was keeping track of student's progress and problems. Moreover, teachers experienced trouble making and maintaining a real connection with the children. We also asked teachers how they supported children with self-regulation during this period of home-schooling. Most mentioned was providing extra structure for specific children and, if necessary and possible, some teachers also asked parents to take on a somewhat larger role in helping their children regulate their work. Moreover, in most classes the children's program was adapted to fit children's academic ability, as well as their ability to self-regulate during the periods of independent work. Insights from this study can help us prepare better for mandated school lockdowns in the future. Moreover, the overview of ways teachers supported children with self-regulation during this period could inspire teachers currently trying to find ways to support SRL in similar situations.

Session C 17

22 August 2023 17:15 - 18:45
UOM_A08
Single Paper
Culture, Morality, Religion and Education, Higher Education, Learning and Social Interaction, Teaching and Teacher Education

Teachers' Self-Efficacy: Different Aspects, Different Contexts

Keywords: Competencies, Cultural Diversity in School, Early Childhood Education, Higher Education, In-service Teachers, Quantitative Methods, Self-efficacy, Social Interaction, Teacher Efficacy, Teaching Approaches, Teaching/Instructional Strategies, Tool Development
Interest group: SIG 04 - Higher Education, SIG 05 - Learning and Development in Early Childhood, SIG 08 - Motivation and Emotion
Chairperson: Ella AIT-ZAOUIT, Fontys University of Applied Sciences, Netherlands

University teachers' self-efficacy beliefs
Keywords: Higher Education, Self-efficacy, Teacher Efficacy, Teaching/Instructional Strategies

Presenting Author: Irene Douwes-van Ark, University of Groningen, Netherlands; **Co-Author:**Marjon Fokkens-Bruinsma, University of Groningen, Netherlands; **Co-Author:**Jan Folkert Deinum, University of Groningen, Netherlands; **Co-Author:**Hanke Korpershoek, University of Groningen, Netherlands

The purpose of this study is to contribute to the understanding of university teachers' self-efficacy beliefs. For this purpose, we developed an instrument regarding six teaching domains: course design, instructional strategies, creating a positive learning climate, student engagement, assessment and professional development. Research on this topic is scarce, which hampers evidence-informed teacher professionalization at the university level. A survey was administered to a sample of 105 university teachers. Our findings suggest that university teachers had the highest self-efficacy beliefs on course design, instructional strategies and creating a positive learning climate; but their beliefs regarding assessment, student engagement and professional development were slightly lower.

Teachers' teaching profiles and self-efficacy as measured through the HEAT inventory
Keywords: Higher Education, Quantitative Methods, Self-efficacy, Teaching Approaches
Presenting Author: Liisa Postareff, HAMK University of Applied Sciences, Finland; **Co-Author:**Juulia Lahdenperä, Häme University of Applied Sciences, Finland; **Co-Author:**Telle Hailikari, Häme University of Applied Sciences, Finland; **Co-Author:**Anna Parpala, University of Helsinki, Finland

Higher education (HE) teachers' approaches to teaching, i.e.teaching processes and intentions, have been explored since the early 1990's. The exploration has been mainly done using quantitative instruments, although criticized for being too narrowly examining the dimensions of teaching. The HEAT (Higher Education Approaches to Teaching) instrument aims to capture the dimensions of HE teaching more broadly using the previous quantitative and qualitative research on approaches to learning as a basis. The aims of the study are 1) to validate the HEAT inventory measuring dimensions of approaches to teaching, and scale measuring self-efficacy, and 2) to explore what kind of individual teaching profiles can be identified among higher education teachers and 3) how the profiles are related to the teachers' self-efficacy beliefs. The results showed that HEAT is a valid instrument to measure teachers' approaches to teaching in a wider HE context. Teachers' ability to reflect their teaching has an important role in teaching and should, thus, be developed in HE context. Moreover, the results show that different profiles of approaches to teaching emerge among HE teachers, and that the profiles differ in terms of self-efficacy.

Teachers' social self-efficacy as a predictor of teacher-child relationships quality in Greek ECE
Keywords: Early Childhood Education, Social Interaction, Teacher Efficacy, Tool Development
Presenting Author: Anastasia Vatou, International Hellenic University, Greece; **Co-Author:**Athanasios Gregoriadis, Aristotle University of Thessaloniki, Greece; **Co-Author:**Nikolaos Tsigilis, Aristotle University of Thessaloniki, Greece; **Co-Author:**Vasileios Grammatikopoulos, International Hellenic University, Greece

The importance of teacher-child relationships for students' development and teachers' wellbeing is well established in the context of Early Childhood Education and Care (ECEC) (OECD, 2020). Teachers' competence to enhance supportive relationships with students is a crucial aspect of their professional role (Rimm-Kaufman et al., 2003). Teachers with high sense of competence in developing positive relationships with their students, reflect this also in their sense of social self-efficacy (Vatou et al., 2022). The purpose of this study was twofold. The first aim was to test the validity of the Teacher Social Self-Efficacy Scale (TSSES) in the Greek educational context. The second purpose was to investigate whether the teachers' social self-efficacy beliefs predict the teacher-student relationships quality. The sample included 488 early childhood teachers to investigate the construct validity of TSSES. A second sample of 112 teachers completed the TSSES and also completed the Student-Teacher Relationship Scale (Koomen et al., 2012) for their students (N=897) to obtain evidence for the predictive validity of TSSES. Results provided convincing evidence for the factor structure, reliability, and validity of the TSSES. The TSSES displayed good psychometric properties for measuring teachers' social self-efficacy. Results from the ICC provided initial support for using a multilevel approach (.354 for closeness, .138 for conflict, and .432 for dependency). Multilevel analyses found that teachers' social self-efficacy positively contributed to closeness and negatively associated with conflict. Collectively, findings highlight the importance of supporting teachers' social self-efficacy. Limitations and implications for policy makers, practitioners and education researchers are also discussed.

Teachers' self-efficacy and intercultural classroom practices in diverse classroom contexts
Keywords: Competencies, Cultural Diversity in School, In-service Teachers, Teacher Efficacy
Presenting Author: Pauline Slot, Utrecht University, Netherlands; **Co-Author:**Paul Leseman, Utrecht University, Netherlands; **Co-Author:**Bodine Romijn, Utrecht University, Netherlands; **Co-Author:**Valentina Pagani, Università di Milano Bicocca, Italy

The concept of teacher efficacy plays an important role in explaining differences in overall teacher effectiveness and is a positive factor in helping teachers deal with the challenges and uncertainties in education. Little attention is devoted to teacher efficacy in ethnically diverse classrooms, despite the increasing cultural diversity in society. This cross-national study provides new insights in teacher efficacy in today's culturally diverse classrooms using survey data of 269 early childhood and primary school teachers in England, Italy, the Netherlands and Poland. Teacher efficacy can be viewed as a two dimensional concept in which both general beliefs are measured alongside (diversity-related) domain-specific beliefs. These beliefs are related to the cultural classroom context and the use of intercultural classroom practices. Teachers working in more diverse classrooms, feel more efficacious working with diverse student populations and report they are more often engaged in intercultural classroom practices, which in turn provides them with new opportunities to build up their self-efficacy. Our results indicate that policies and professional development targeted at the reciprocal relation between diversity-related efficacy and practices are important when preparing teachers for working in diverse classroom contexts.

Session C 18

22 August 2023 17:15 - 18:45
UOM_R08
Single Paper
Assessment and Evaluation, Higher Education, Learning and Social Interaction, Motivational, Social and Affective Processes

Belonging, Well-being and Mental Health in Education

Keywords: Burnout, Emotion and Affect, Health-care Education, Higher Education, Peer Interaction, Resilience, Secondary Education, Self-efficacy, Teacher Professional Development, Teaching/Instructional Strategies, Well-being
Interest group: SIG 04 - Higher Education, SIG 10 - Social Interaction in Learning and Instruction, SIG 14 - Learning and Professional Development
Chairperson: David Thore Gravesen, Denmark

Effects of Supplemental Instruction on Grades, Well-being and Belonging: a Field Experiment
Keywords: Higher Education, Peer Interaction, Teaching/Instructional Strategies, Well-being
Presenting Author: Izaak Dekker, Amsterdam University of Applied Sciences (AUAS), Netherlands; **Co-Author:**Jantien Stam, Faculty of Education, Amsterdam University of Applied Sciences, Netherlands

Supplemental Instruction (SI) is a form of structured peer guidance attached to a specific course, provided by an experienced and trained student to a group of students. Previous studies show a positive effect of SI on learning outcomes, some found effects on well-being, and sense of belonging. However, literature on SI lacks randomized controlled trials and does not fully address the risk of self-selection bias. The current study tested whether SI has an effect on grades, mental well-being, and sense of belonging with a pre-registered randomized controlled trial and a sample of 493 Dutch first-year students. Students who were offered SI obtained significantly higher grades (d = 0.26) but did not score significantly different on mental well-being or belonging.

Peer support in enhancing students' sense of belonging, study engagement and life satisfaction
Keywords: Emotion and Affect, Peer Interaction, Secondary Education, Well-being
Presenting Author: Sanna Ulmanen, University of Helsinki, Finland; **Co-Author:**Lotta Tikkanen, University of Helsinki, Finland

Previous research suggests that, for adolescents, peer support is an essential enabler of students' sense of belonging in peer interaction and correlates with study wellbeing and general wellbeing. However, it remains unclear what the underlying mechanism explaining these relationships is. Therefore, this study

examined whether the effect of peer support on life satisfaction is mediated by a sense of belonging in peer interaction or study engagement. The path model was tested with structural equation modeling (SEM), using a cross-sectional sample of Finnish upper secondary education students (n=280) (69% female, 28% male). The results showed that school-related social support shared among peers is associated with higher levels of sense of belonging and study engagement. Furthermore, the direct effect of school-related peer support on life satisfaction was negative, but indirect effects through study engagement and sense of belonging were positive. The results implied that to enhance upper secondary education life satisfaction, school-related peer support needs to be cultivated so that it enhances students' sense of belonging and study engagement.

What keeps first-year medical students mentally healthy? – A latent profile analysis
Keywords: Emotion and Affect, Higher Education, Resilience, Self-efficacy
Presenting Author: Sabine Polujanski, University of Augsburg, Germany; **Co-Author:**Thomas Rotthoff, Augsburg University, Germany; **Co-Author:**Ulrike Nett, Augsburg University, Germany; **Co-Author:**Ann-Kathrin Schindler, Augsburg University, Germany

AbstractPrevious meta-analytic data have demonstrated the propensity for mental morbidity among medical students. However, there is a lack of research on medical students' varying depression vulnerabilities and predictive factors. The present study aims to achieve a better understanding of the development of mental health morbidity and predictive factors in first-semester medical students. In November 2020 and January 2021, 184 first-semester students from two German medical schools with a reformed competency-based curriculum were surveyed regarding depression (PHQ-9), self-efficacy, resilience, and cognitive self-regulation. Using latent profile analysis, we identified differing depression development profiles. We applied a multinomial logistic regression analysis to determine how self-efficacy, resilience, and cognitive self-regulation and its changes predicted profile membership. Five different profiles of depression development were identified: Profile 1, no depression (53.8%); Profile 2, mild depression (26.1%); Profile 3, depression increase I (9.2%); Profile 4, depression increase II (9.8%); and Profile 5, persistent depression (1.1%). Students with initial high values of self-efficacy, resilience, and cognitive self-regulation were more likely to belong to the no depression group. A decrease in self-efficacy and cognitive self-regulation was associated with both depression increase profiles (I and II), and a decrease in resilience was found to be a predictor for the depression increase II profile. In conclusion, students who enter medical school have varying levels of mental health, and they differ in their vulnerability to developing depressive symptoms. The promotion of resilience, self-efficacy, and cognitive self-regulation strategies may be key in preventing students' depression in the first semester of medical school.

Living better! Self-care for teachers – Effects of a prevention and health promotion intervention
Keywords: Burnout, Health-care Education, Teacher Professional Development, Well-being
Presenting Author: Ingmar Hosenfeld, University of Kaiserslautern- Landau (RPTU), Germany; **Co-Author:**Malte Cramer, University of Koblenz - Landau, Germany; **Co-Author:**Gabriele E. Dlugosch, University of Koblenz - Landau, Germany; **Co-Author:**Teresa Noichl, University of Koblenz - Landau, Germany; **Co-Author:**Inga Wagner, University of Koblenz-Landau, Germany

Teachers are exposed to a variety of stresses in their work context (Klusmann & Waschke, 2018). These can have a negative impact on their physical and mental well-being (Scheuch et al., 2015).
An online intervention for prevention and health promotion for teachers is tested for its effectiveness in an experimental study. The aim of the intervention is to promote self-care and mindfulness among participants and thereby prevent possible consequences of work-related strains, such as stress or burnout, and to strengthen mental health.
The study is designed as a randomized 2*2 factorial wait-list control group repeated-measures design with 4 (treatment group) resp. 6 (wait-list control group) measurement time points. Central dependent variables are measures of self-care, mindfulness, stress experience, emotional exhaustion as an indicator for burnout, self-efficacy and well-being. In order to assess the short- and medium-term effectiveness of intervention participation, these constructs are surveyed 5 weeks and 1 year after the intervention.As expected, the first follow-up (5 weeks after the intervention) shows a significant increase in the variables mindfulness and self-care and a significant decrease in the variables stress and emotional exhaustion. Effect sizes can be rated as medium to large. In addition to the comparison between treatment and wait-list control group, the results regarding the effectiveness of the intervention up to one year later are also presented and discussed.

Session C 19

22 August 2023 17:15 - 18:45
AUTH_T002
Single Paper
Learning and Social Interaction, Motivational, Social and Affective Processes

Different Aspects of Parental Involvement in Children's Education

Keywords: Achievement, Anxiety and Stress, Early Childhood Education, Engagement, Learning and Developmental Disabilities, Learning Approaches, Motivation, Parental Involvement in Learning, Primary Education, Quantitative Methods, Social Interaction
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 08 - Motivation and Emotion
Chairperson: Katrine Nesje, University of Oslo, Norway

Patterns of Partnership Practices: Digital Media vs. Face-to-Face Contact?
Keywords: Early Childhood Education, Parental Involvement in Learning, Quantitative Methods, Social Interaction
Presenting Author: Yvonne Anders, Otto-Friedrich-University of Bamberg, Germany; **Co-Author:**Theresia Gabriele Hummel, Otto-Friedrich-University of Bamberg, Germany

Previous research has demonstrated that supportive partnerships between the home and preschool setting contribute beneficially to child development (e.g., Clarke et al., 2017). However, a lack of time, different interests, or language barriers often prevent the successful implementation of partnership activities. The use of digital media offers flexibility and increased accessibility for families, and thus the opportunity to overcome existing barriers and establish new approaches to parental involvement (e.g. Hall & Biermann, 2015). Therefore, the present study examines the frequency and intensity of teachers' partnership practices, and the role of digital media in partnership practices. 198 teachers of 88 preschools participated in the study. All data were obtained in the context of the evaluation of a German governmental preschool initiative. Different aspects of teachers' partnership practices were assessed using quantitative diaries. In a total of one-fifth of all diaries (19.7%), teachers reported being involved in partnership practices. On average, professionals spent 44 minutes (*SD* = 41.10) per day cooperating with families. Digital media were used on 16.9% of all days when teachers were involved in partnership activities. Multifunctional media such as tablets (in 32.3% of the situations), smartphones (25.8%) or laptops (22.6%) are used most frequently. The results of the present study highlight that partnership activities are not part of preschool teachers' daily work. When teachers are involved in partnership activities, face-to-face contact predominates. Consequently, training programs should make use of these results to raise teachers' awareness of the opportunities offered by digital media in partnership activities.

Math motivation and math achievement in primary school: Relationship with parents practices
Keywords: Achievement, Motivation, Parental Involvement in Learning, Primary Education
Presenting Author: Francisco Peixoto, ISPA - Instituto Universitário | Center for Research in Education, Portugal; **Co-Author:**Lourdes Mata, ISPA - Instituto Universitário | Center for Research in Education, Portugal; **Co-Author:**Mafalda Campos, ISPA - Instituto Universitário | Center for Research in Education, Portugal; **Co-Author:**Jelena Radisic, University of Oslo, Norway

Parenting practices, beliefs and involvement have been shown to impact the schooling experience of their children significantly. The current study aimed to explore the associations between parent practices on motivation dimensions in mathematics learning and achievement based on the Expectancy-Value (EV) theory and previous research on the mediating role of parent involvement-related variables. Participants were 1839 third and fourth graders who filled out the *Expectancy-Value Scale* (*EVS*) and completed two math tasks. The children's parents completed the Parent Scale, aimed at assessing parents' practices concerning how math was approached in the household and in the relationship between the parents and the child. Math motivation was operationalised by five

dimensions comprising EVS (i.e., perception of competence, attainment value, utility value, intrinsic value, and cost). Parent practices were operationalised by four dimensions, depending on the primary goal of such practices—practices promoting interests, emphasising costs, structuring learning, and practices supportive of learning. Math achievement was operationalised as a joined result on two math tests.Analysis conducted using Structural Equation Modelling allowed us to identify that different parental practices are associated in specific ways with students' values, perception of competence, and academic achievement. These findings have implications for practice—identifying parental practices that can be detrimental to achievement and self-concept, and for research, accentuating the need for more fine-tuned data analyses that enable nuanced differentiation between unfavourable parental practices and what is merely the result of students with lower achievement needing more help.

Family involvement, student behavioural engagement and approach to homework: a longitudinal study
Keywords: Engagement, Learning Approaches, Parental Involvement in Learning, Primary Education
Presenting Author: Carolina Rodríguez Llorente, Universidad de La Coruña, Spain; **Co-Author:**Rocío González-Suárez, Camilo Jose Cela University, Spain; **Co-Author:**María Cabana-Bedoya, Universidad de La Coruña, Spain; **Co-Author:**Emmanuel Manalo, Kyoto University, Japan

Family involvement in the homework process has been proven to improve the quality of students' engagement in the completion of homework and their academic achievement. Similarly, how students behave while completing homework may affect the studying/learning approach they adopt towards it. Taking a longitudinal perspective, this research examined the effect of family involvement and student behavioural engagement in homework on the studying/learning approach to homework (deep and superficial) that students take. Data from 229 students (52.2% male) on family involvement, behavioural engagement, and approach to homework were collected over three consecutive years. Our results show that when students perceive that their parents prioritise homework completion (Grade 4) and when they manage homework time and understand its usefulness (Grade 5), they adopt a deep studying/learning approach to completing their homework (Grade 6). In contrast, when students say their family uses rewards (Grade 4), a superficial approach to completing homework is predicted (Grade 6). However, family confidence (Grade 4) and homework time management (Grade 5) negatively predicted the superficial approach to homework. It is worth noting the long-term effect of rewarding children for doing their homework on how they approach homework (e.g., to avoid punishment or without paying much attention).

Homework Stress and Learning Disability: The Role of Parental Shame, Guilt, and Need Frustration
Keywords: Anxiety and Stress, Learning and Developmental Disabilities, Motivation, Parental Involvement in Learning
Presenting Author: Idit Katz, Ben-Gurion University of the Negev, Israel; **Co-Author:**Marianna Alesi, Ricercatore Università di Palermo, Italy; **Co-Author:**Angelica Moè, University of Padova, Italy

Using a cross-sectional design, this study examined the relationships between parental guilt, shame, need frustration, and homework stress in students with Learning Disabilities (LD) or Typically Developing (TD) and their parents. One hundred and eight parent-child dyads (54 LD, 54 TD) filled in questionnaires to assess homework stress, parental need frustration, guilt, and shame. The results showed that parents of students with LD reported more stress, need frustration, shame, and guilt than parents of TD students. In the LD group, shame mediated the association between parental need frustration and parental and child stress, and guilt mediated the association between parental need frustration and parental stress. The theoretical and practical implications for lessening homework stress for students with LD and their parents are discussed.

Session C 20

22 August 2023 17:15 - 18:45
UOM_A04
Single Paper
Cognitive Science, Teaching and Teacher Education

Pre-service Science Teachers

Keywords: Educational Technologies, Higher Education, Instructional Design, Misconceptions, Pre-service Teachers, Primary Education, Qualitative Methods, Science Education, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education
Chairperson: Marije Lesterhuis, Netherlands

Analyzing data in the physics laboratory by pre-service physics teachers'
Keywords: Higher Education, Misconceptions, Pre-service Teachers, Science Education
Presenting Author: Ida Kukliansky, Ruppin Academic Center, Israel

Conceptual change in every subject can be made only after a deep understanding of the misconceptions of the learners. The present research examines the barriers pre-service physics teachers confront with when dealing with data analysis tasks in the introductory physics laboratory. Analyzing and interpreting data, collected in the experiments, helps to bridge the gap between the experiment's results and the theoretical world and to establish a better connection between the scientific experiment and theory. Identifying pre-service physics teachers' misconceptions is very important because the future teachers can transfer them to their students. The novelty of this research is not only in identifying the pre-service physics teacher's misconceptions analyzing data in the introductory physics laboratory, but also in explaining the reasons for them. 25 pre-service physics teachers who had undergone several laboratory courses participated in this study. For examining their knowledge level and identifying their difficulties in data analysis, the Laboratory Data Analysis Instrument (LDAI) was used. The results revealed that the participants evidenced a sixty-nine percent overall average of correct answers. The various misconceptions the pre-service physics teachers encountered in each of the instrument objectives are identified and discussed. Dealing with multiple representations and the use of intuitive rules can explain some of the difficulties. The identification of the data analysis difficulties can be employed by educators in teacher teaching attempting to construct more efficient learning environments for conceptual change.

Characteristics of productive discourse in undergraduate courses for student science teachers
Keywords: Pre-service Teachers, Qualitative Methods, Teacher Professional Development, Teaching/Instructional Strategies
Presenting Author: Hadeel Edrees Dabbah, Ben Gurion University of the Negev, Israel, Israel; **Co-Author:**Orit Ben Zvi-Assaraf, Ben-Gurion University of the Negev, Israel

Productive discourse promotes and encourages collaborative and meaningful learning among students. Science teachers, however, often have difficulty incorporating it into their lessons. To successfully implement such discourse practices, teachers must receive preparation while training as student science teachers in colleges. We used a linguistic ethnographic method to explore the characteristics of the productive scientific discourse in undergraduate science courses for pre-service science teachers in a teachers' college in Israel's Arab sector. The exemplar case presented here shows several features of productive discourse, some related to the lecturer such as: elaboration, uptake question, challenging in order to press for reasoning; and others to the student contributions such as: an expansion on their statement or/and another one made by a classmate. Furthermore, we found characteristics for a hybrid discourse that formed when students and lecturers combined everyday knowledge and discourse resources, often drawn from popular culture, with disciplinary scientific discourse. Such a combination created a new space for learning where it is permissible to laugh and use humor, and where one can share naive knowledge that originates outside the walls of the science classroom (such as media). Based on our findings, we recommend implementing such strategies into preservice professional development, allowing college lecturers conduct similar reflective analyses of examples from their own lectures, so as to identify and develop opportunities for productive scientific discourse.Keywords: productive scientific discourse, preservice science teacher education, multimodal micro-analytic methods, linguistic ethnographic approach.

Facilitating coherent science instruction for pre-service teachers by reflection
Keywords: Educational Technologies, Instructional Design, Pre-service Teachers, Science Education

Presenting Author: Miikka Turkkila, University of Helsinki, Finland; **Co-Author:**Merike Kesler, University of Helsinki, Finland; **Co-Author:**Antti Laherto, University of Helsinki, Finland; **Co-Author:**Jari Lavonen, University of Helsinki, Finland; **Co-Author:**Kalle Juuti, University of Helsinki, Finland

Pre-service teachers (PSTs) have difficulties applying their pedagogical studies into practice. Supporting PSTs reflections during practical training could help with this difficulty and enrich PSTs pedagogical content knowledge. We have designed a tool to facilitate reflection on coherent science instruction. Coherent science instruction is emphasized in several curriculums and is shown to support student learning. The tool can be used to code, in real-time, coherent science instructions observed in practice lesson by a peer PST observing the lesson. The tool then draws a timeline of the coded activities. The aim for using the tool is threefold. It directs the student teacher to plan their practice lessons according to the coherent science instruction principles. It activates and guides PSTs what to observe in a peer's practice lesson. Finally, with the help of the timeline, it makes visible what coherent activities the lesson included. The timeline serves as a basis for post-lesson reflective discussion between mentoring teacher and PSTs, giving a structure to the reflection and helps focus attention on the activity. In the presentation, we show how the use of the tool produces reflection on coherent science instruction and discuss the connection of reflection to the goals of teacher education.

Prospective teachers' use of construal-based intuitive explanations in science instructions
Keywords: Misconceptions, Pre-service Teachers, Primary Education, Science Education
Presenting Author: Sebastian Tempelmann, Institute for Research, & Development, Germany; **Co-Author:**Jakub Sowula, University of Teacher Education Berne, CH// University of Tuebingen, GER, Switzerland; **Co-Author:**Trix Cacchione, University of Teachereducation FHNW (PH FHNW), Switzerland

Science educators' explanations of natural phenomena are often affected by cognitive construals (e.g., *teleology* & *anthropomorphism),* although those often contradict scientifically accepted conceptions and are seen as causes of persistent misconceptions. Simultaneously, using such can facilitate learning. As it is not likely to overcome intuitive explanations (cf. *explanatory coexistence)*, didactic concepts aim to enable students to distinguish between intuitive and scientific explanations with the goal of explicit "bilingualism". While this places great subject-knowledge and didactic demands on teachers and their training, it could enable reasoned use of construals in science teaching and promote learning success. However, while the use of construal-based explanations in science teaching is well documented, systematic research is lacking on why educators rely on them. Both *didactic reasons* and *lack of expertise* are possible, with widely divergent implications for educational practice and teacher training. In this exploratory study, we contribute to this debate by investigating Swiss prospective primary teachers' written explanations of two scientific phenomena of inanimate nature (collision/combustion) towards fictitious recipients with varying expertise (primary students/experts) for construal-based expressions. On average, participants used significantly more construal-based statements when the addressees were students rather than experts. Furthermore, we were able to attribute most of the participants' construal-based explanations to the didactic context (especially for *anthropomorphic* explanations). However, even for the *anthropomorphic* explanations, a considerable proportion of participants used construals due to a *lack of expertise*. Implications of results are discussed, and recommendations for educational practice and (Swiss) primary teacher training are formulated.

Session C 21

22 August 2023 17:15 - 18:45
AUTH_T102
Single Paper
Lifelong Learning, Teaching and Teacher Education

Teachers' Professional Learning Communities and Lifelong Learning Competencies

Keywords: Communities of Learners and/or Practice, Competencies, In-service Teachers, Lifelong Learning, Mixed-method Research, Pre-service Teachers, Qualitative Methods, Quantitative Methods, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development, SIG 25 - Educational Theory
Chairperson: Denis Francesconi, University of Vienna, Austria

The Contributions of Unique Professional Learning Communities with Preservice and Tutor Teachers
Keywords: Communities of Learners and/or Practice, Lifelong Learning, Pre-service Teachers, Teacher Professional Development
Presenting Author: Orna Heaysman, Hemdat College of Education, Israel; **Presenting Author:**ALISA AMIR, Achva College of Education, Israel; **Co-Author:**Orit Avidov-Ungar, Achva College of Education, Israel; **Co-Author:**Revital Amzaleg, Achva College of Education, Israel; **Co-Author:**Yousif.a.l.a3@gmail.com Alamour, Achva College of Education, Israel

The need to promote teachers' life-long learning as well as strengthen the partnership between academia and the educational field has led to the creation of a novel type of professional learning community, that involves preservice (student) teachers learning together with tutor teachers and guided by an academic coordinator. This type of professional learning community, called "Academy–Classroom", was recently introduced by the Ministry of Education in Israel. The goal of the current study was to examine the contributions of participating in the "Academy–Classroom" community according to the participants' perceptions. The research method was qualitative. The study examined two "Academy–Classroom" communities from two primary schools in Israel, including 35 participants. The research tool was semi-structured interviews which were analyzed using the content analysis method via the ATLAS.ti.8 software. The content analysis revealed four main contributions of the communities: collaboration and a sense of belonging, teaching practice and self-efficacy in teaching, a sense of empowerment and autonomy, and motivation to succeed in teaching. In light of the findings, we recommend providing this type of professional learning community as part of the preservice teacher training and as a professional development program for in-service teachers.

Regression Model of Lifelong Learning Competencies for the Teacher Trainers
Keywords: Competencies, In-service Teachers, Lifelong Learning, Teacher Professional Development
Presenting Author: Win Phyu Thwe, University of Szeged, Doctoral School of Education, Hungary; **Co-Author:**Anikó Kálmán, University of Szeged, Doctoral School of Education, Hungary

A lifelong learner is a person who embraces learning and possesses the competencies that are necessary for their lifetime. Researches focused on the lifelong learning and other variables such as motivation, reading motivation, achievement goal, self-directed learning, self-regulated learning, self-competency belief, organizational culture, educational technology, lifelong learning attitudes, perceptions on lifelong learning, lifelong learning tendencies, lifelong learning skills, lifelong learning dispositions and lifelong learning competencies. In the literature review, there was not any study in teacher education that explored the factors to improve lifelong learning competencies of teacher trainers. We used the three instruments such as perception on lifelong learning, lifelong learning competencies and learning strategies together with demographic part. Multiple linear regression analysis was carried out to predict factors affecting on lifelong learning competencies of teacher trainers. The overall model fit was $R^2 = 0.73$ which means that three independent variables explained 73% of the differences in how lifelong learning competencies are acquired. According to the results, personal and professional factors, as well as gender, age, and education level, play little role in determining lifelong learning competencies. Lifelong learning competencies depends on the region they are working, how they perceive the lifelong learning and how they use learning strategies.

A socio-material framework to examine teachers' lifelong professional development trajectories
Keywords: In-service Teachers, Mixed-method Research, Qualitative Methods, Teacher Professional Development
Presenting Author: Giuseppe Ritella, University of Campania Luigi Vanvitelli, Italy; **Co-Author:**Alessio Surian, Università degli Studi di Padova, Italy

We discuss a theoretical-methodological framework to examine teachers' lifelong professional development trajectories across formal and informal learning experiences. Teachers develop their expertise through a wide range of learning activities across formal and informal contexts, often involving the use of several digital tools. Examining teachers' learning thus requires addressing the complexity of the interconnections between the digital, physical and institutional contexts where professional development takes place, the relevant social relationships established and maintained across multiple situations of learning, as well as the

virtual and material objects that the teachers manipulate when engaging in learning practices. The framework is based on the posthuman tradition that emphasizes that materials are not merely mediators of human activities but are constitutive of practice. Methodologically, we adopt a multiple case studies approach with teachers' professional stories as units of analysis. We collect data through interviews based on a life narrative approach, including the drawing of a temporally layered visual representation in addition to answering questions concerning the qualitative nature of the sociomaterial elements composing teachers' learning trajectory. The drawings can be considered as egocentric socio-material networks that can be examined by Social Network Analysis lenses triangulated with the thematic analysis of the transcripts.We conducted an exploratory analysis of 4 cases and compared the sociomaterial networks based on their dimensions, heterogeneity, density and components, as well as on the meanings that each teacher associated with different moments and elements of learning trajectories. We use illustrative examples to discuss the significance and limitations of the proposed framework.

Exploring motivation to transfer in Early Childhood Education teachers in Mexico
Keywords: In-service Teachers, Lifelong Learning, Quantitative Methods, Teacher Professional Development
Presenting Author: Carla Quesada-Pallarès, Universitat Autònoma de Barcelona, Spain; **Co-Author:**Karla Villaseñor, Benemérita Universidad Autónoma de Puebla, Mexico; **Co-Author:**Cristina Torrelles, Institut Nacional d'Educació Física de Catalunya, Spain; **Co-Author:**Carlos Enrique Silva, Benemérita Universidad Autónoma de Puebla, Mexico

Training of in-service teachers is a good strategy to maximize the quality of Early Childhood Care and Education (ECCE). In May 2021, during the covid-19 lockdown, the Puebla Ministry of Education (Mexico) offered five online courses aimed at ECCE teachers. 2,865 successfully completed the courses. Upon completion of the courses, we applied the Quesada-Pallarès et al. (2018) Transfer of Learning Factors Model to analyze the impact of individual factors on learning transfer during the covid-19 pandemic. Two instruments at different times were applied: at the end of training courses and three months later. We conducted both a Confirmatory Factor Analysis and an Exploratory Structural Equation Modelling. Results showed that most teachers were willing to transfer the learning acquired during the courses. The Model predicted that teachers would devise plans and strategies for applying the contents learned guided by their own desire to transfer. In this regard, it might be asserted that the will to transfer is steered by teachers' autonomous drive to transfer. Considering these results is key to understand teachers' learning transfer and to adjust training to their needs and willingness.

Session C 22

22 August 2023 17:15 - 18:45
AUTH_T202
Single Paper
Instructional Design, Learning and Instructional Technology, Teaching and Teacher Education

Instructional Design

Keywords: Attitudes and Beliefs, Computational Thinking, In-service Teachers, Instructional Design, Knowledge Construction, Learning Strategies, Meta-analysis, Metacognition, Primary Education, Quantitative Methods, Teaching Approaches, Teaching/Instructional Strategies
Interest group: SIG 06 - Instructional Design, SIG 11 - Teaching and Teacher Education
Chairperson: Eveline Wuttke, Goethe-Universität Frankfurt, Germany

The Flow-State of Teachers and the Learning Space: The Role of the Design Conditions
Keywords: Attitudes and Beliefs, Instructional Design, Teaching Approaches, Teaching/Instructional Strategies
Presenting Author: Tamir Zausmer, Tel-Hai Academic College & Golan Research Institute, Israel; **Co-Author:**Orly Dahan, Tel-Hai Academic College, Israel; **Co-Author:**Irit Sasson, Tel-Hai College, Israel

In recent years there has been growing need to adopt pedagogical changes and design new learning environments. Previous studies examined aspects relating to learning spaces mainly from a pedagogical and architectural design point of view. This study examines learning spaces from an innovative perspective of flow theory. Flow is a state in which a person is in full concentration of his/her mental abilities, causing them to be completely absorbed in his/her activity, directed at achieving peak performance. We raised three research questions: 1) what are the factors that significantly predict teachers' flow-state?; 2) do teachers' flow-state differ between learning spaces? If so, what are the differences?; and 3) how dose age affect the relationship between the learning space design conditions and teachers' flow-state? A total of 119 teachers responded to a close-ended questionnaire, sampling three types of learning spaces: traditional classrooms; innovative, open, and collaborative learning spaces; and forest education. The tracking dimension that refers to structural characteristics such as lighting, temperature, ventilation, and noise significantly predicted teachers' flow-state. Significant differences in flow levels were found between a learning environment in nature compared to traditional classrooms. The age of the teachers was found to significantly moderate the relationship between design conditions of the learning space and the dimension of cognitive control in teachers' flow-state. While the relationship is weak among young teachers, older teachers are strongly affected by low design conditions thus leading to diminishing flow-state levels within this age group.

The Effects of Age and Interactions with the Robots Dash and Dot on Students' Computational Thinking
Keywords: Computational Thinking, Instructional Design, Primary Education, Quantitative Methods
Presenting Author: Yiota H. Diakou, University of Cyprus, Cyprus; **Co-Author:**Vaso Anastasiou, University of Cyprus, Cyprus; **Co-Author:**Charoula Angeli, University of Cyprus, Cyprus

Although there has been an increased interest during the last years in integrating Computational Thinking (CT) in school curricula, the computational thinking theory is still developing (Angeli & Giannakos, 2020). Educational Robotics (ER) is increasingly used in classrooms to develop students' CT skills (Chevalier et al., 2021). However, the existing body of research does not provide robust empirical evidence of learning gains in computational thinking when using educational robotics (Angeli & Valanides, 2019). This study examined the development of CT skills of primary-school children aged 6, 9, and 12 when doing robotic activities with Dash and Dot within the context of two teaching interventions. The findings suggest that the teaching technique differentially affects children's performance in computational thinking. Also, the study reports a statistically significant interaction between the teaching intervention and children's age regarding their assessment of CT tasks. Study findings contribute quantitative evidence to the literature on how educational robotics can be used to develop computational thinking in primary students. In addition, the study has practical significance for curriculum developers, instructional leaders, and classroom teachers, as they can use the results of this study to design curricula and classroom activities with a focus on the broader set of CT skills.

Interleaving Effects in Blindfolded Perceptual Learning Across Various Sensory Modalities
Keywords: Instructional Design, Learning Strategies, Meta-analysis, Metacognition
Presenting Author: Roman Abel, Ruhr University Bochum, Germany; **Co-Author:**Julian Roelle, Ruhr-University Bochum, Germany

Research on sequence effects on learning *visual* categories has shown that interleaving (i.e., studying the categories in a mixed manner) facilitates category induction as compared to blocking (i.e., studying the categories one by one), but learners are not aware of the interleaving effect and prefer blocking. However, almost no attention has been paid to sequence effects in perceptual learning across further sensory modalities. The present (preregistered) research addresses this shortcoming by using *auditory* (birdcalls), *olfactory* (tealeaves), *gustatory* (ingredient mixtures), and *tactile* (stones) stimuli across four analogue experiments respectively. Participants studied six categories (with six exemplars respectively) either interleaved or blocked. The numerical benefits of interleaving reached in no experiment the threshold of significance. We ran a comprehensive meta-analysis based on data across experiments, which revealed a significant small effect of interleaving, demonstrating its applicability to perceptual learning across *all* sensory modalities. Learners in the interleaved condition underestimated their classification performance. Overall, learners judged interleaving not less effective than blocking, opposing previous studies that consistently demonstrated metacognitive preference of blocking. Our findings suggest that learners rely less on conventional beliefs about the effectivity of study sequence when dealing with *un*familiar (blindfolded) perceptual learning tasks.

Integration of everyday life aspects in classroom learning

Keywords: In-service Teachers, Knowledge Construction, Primary Education, Teaching/Instructional Strategies
Presenting Author: Anne-Mai Näkk, Tallinn University, Estonia; **Co-Author:**Inge Timoštšuk, Tallinn University, Estonia

In the framework of learning ecosystems, students' learning paths are diverse and include aspects of their personal lives. Learning is meaningful when one is able to connect the subject content to their everyday life and understand the context. Teachers face a challenge to create well-balanced learning situations that integrate students' lives outside the classroom and the curriculum. Moreover, Estonian middle school students have posited that learning is rather subject-centred, and they perceive little personal meaning of the learning content. In Estonia, last year primary school students are being taught by primary teachers and subject teachers, making it an important transitional period for students. During this period, teacher support is crucially important for experiences of meaningful learning, therefore our aim was to examine last year primary school students' (N = 966) perceptions of integration of everyday life aspects in classroom learning (such as practical usefulness, importance, value). Data were collected via an online questionnaire. Using hierarchical and then K-Means cluster analysis, four profiles were found including *Integrators* (20.6%), *Explainers* (29.2%), *Subject-oriented* (17.6%), and *Inconsistent* (32.6%) profile. Further results revealed that perceptions of *Integrators'* and *Explainers'* teaching practices were statistically different regarding all everyday life aspects, whereas some aspects were not perceived significantly different for *Subject-oriented* and *Inconsistent* profiles. The results contribute to the understanding of establishing a rich learning context from the perspective of students. Furthermore, the results highlight a need to emphasise the value of balancing personal contexts and curriculum in classroom teaching practices to support students' meaningful learning.

Session C 23

22 August 2023 17:15 - 18:45
UOM_R09
Single Paper
Teaching and Teacher Education

Well-being in Pre-service and Early Career Teachers

Keywords: Anxiety and Stress, In-service Teachers, Pre-service Teachers, Quantitative Methods, Teacher Professional Development, Tool Development, Well-being
Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education
Chairperson: Erika Schlatter, Leiden University, Netherlands

Well-being while becoming a teacher? A latent profile analysis among pre-service teachers
Keywords: Pre-service Teachers, Quantitative Methods, Teacher Professional Development, Well-being
Presenting Author:MANUELA HALDIMANN, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Tina Hascher, University of Bern, Institute of Educational Science, Switzerland; **Co-Author:**Doreen Flick-Holtsch, University of Zurich, Switzerland

Teacher well-being is becoming increasingly important not only in research (Hascher & Waber, 2021; McCallum et al., 2017) but also in education policy (Viac & Fraser, 2020). However, studies that empirically investigate the well-being of pre-service teachers are scarce (Bjorklund et al., 2021; Corcoran & O'Flaherty, 2022). The aim of the study is therefore to investigate the well-being of pre-service teachers in a multidimensional, context-specific and person-centred way. Drawing on research from the field of well-being psychology (Diener et al., 2018) and based on Hascher's (2004) six-dimensional model of scholastic well-being, we conducted a latent profile analysis among Austrian pre-service teachers (N = 3111). Results revealed four different pre-service teacher profiles. In addition, significant differences between the identified profiles in terms of resilience as well as the anticipated career satisfaction were found. The results underline the importance of conceptualizing well-being as a multidimensional construct. As individuals scored differently on the various dimensions, using a person-centred approach seems promising for analysing well-being. Impulses for the promotion of well-being during the initial teacher education are discussed.

How do trainee teacher's relationship with their mentor explain how trainees experience their work?
Keywords: Anxiety and Stress, In-service Teachers, Teacher Professional Development, Well-being
Presenting Author: Michael Goller, University of Kassel, Germany; **Co-Author:**Elisabeth Maué, University of Konstanz, Germany; **Co-Author:**Caroline Bonnes, University of Konstanz, Germany; **Co-Author:**Tobias Kärner, University of Hohenheim, Germany

The study aims (a) to identify profiles of trainee teachers in terms of their stress and work experiences and (b) to uncover profile differences in regard to dropout intention and perceived relationship between trainee teachers and their mentors. Based on data from 1,756 German trainee (in-service) teachers, three distinct stress and work experience profiles could be identified. Trainee teachers with high levels of stress and negative work experiences exhibit higher dropout intentions and experience their relationship with their mentors as less transparent, fair and trusting, and more ambivalent compared to trainee teachers with low levels of stress and positive work experiences. The results underline the importance of the relationship between mentors and trainee teachers for the professional development of future teachers.

Adaptation and Validation of a Measure of Preservice Teachers' Positive Mental Health Literacy
Keywords: Pre-service Teachers, Teacher Professional Development, Tool Development, Well-being
Presenting Author: Ma. Jenina N. Nalipay, The Chinese University of Hong Kong, Hong Kong; **Co-Author:**Ching-Sing Chai, The Chinese University of Hong Kong, Hong Kong; **Co-Author:**Morris Siu-yung Jong, The Chinese University of Hong Kong, Hong Kong; **Co-Author:**Ronnel Bornasal King, The Chinese University of Hong Kong, Hong Kong; **Co-Author:**Imelu G. Mordeno, Mindanao State University-Iligan Institute of Technology, Philippines

Mental health promotion is increasingly being recognized as an important teacher competency. Hence, teachers should have sufficient mental health literacy (MHL). However, most MHL research and programs for teachers focus on their knowledge of mental disorders, while very few have explored teachers' positive mental health knowledge. To address this limitation, we adapted and validated a measure of positive MHL, the Mental Health-promoting Knowledge Scale (MHPKS), for preservice teachers. The sample included 470 Filipino preservice teachers. Results of confirmatory factor analysis supported both the 1- and 3-factor (i.e., autonomy, competence, and relatedness-promoting knowledge) models of MHPKS. Positive relationships with knowledge of mental disorders, well-being, and teaching engagement and satisfaction were found, indicating construct validity. MHPKS is a valid tool that can be used to measure preservice teachers' positive MHL.

Session C 24

22 August 2023 17:15 - 18:45
UOM_R02
Poster Presentation
Higher Education, Learning and Instructional Technology, Learning and Social Interaction

Learning and Instructional Technologies

Keywords: Citizenship Education, Developmental Processes, Dialogic Pedagogy, Educational Technologies, Emotion and Affect, Environmental Education, Higher Education, Immersive Technologies for Learning, Instructional Design, Learning Approaches, Learning Strategies, Mixed-method Research, Multicultural Education, Secondary Education, Simulation-based Learning, Social Aspects of Learning and Teaching, Vocational Education and Apprenticeship Training
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 10 - Social Interaction in Learning and Instruction, SIG 14 - Learning and Professional Development
Chairperson: Kateryna Zabolotna, University of Oulu, Finland, Finland

Immersive Virtual Reality as a pedagogical tool for climate change education

Keywords: Environmental Education, Immersive Technologies for Learning, Instructional Design, Secondary Education
Presenting Author: Valdemar Stenberdt, University of Copenhagen, Denmark; **Co-Author:**Guido Makransky, University of Copenhagen, Denmark

The rapid digitalization following COVID-19 necessitates best-practice knowledge on how to use pedagogical tools such as Immersive Virtual Reality (IVR). At the same time, to deal with climate change, we require new ways to embed climate change education in formal education. The current paper explores the use of an IVR simulation on waste management for climate change education. A total of 134 high school students participated in a preregistered intervention investigating the impact of IVR on knowledge and intentions to act pro-environmentally. A 2x2 design was used to compare the type of instruction (Direct Instruction vs. Productive Failure), and type of feedback (Corrective Feedback vs. Exaggerated Feedback). Results indicated that IVR was effective for increasing students' knowledge (η^2 = .38), intentions (η^2 = .14), self-efficacy (η^2 = 0.42), and response efficacy (η^2 = 0.32), and students found the simulation interesting and enjoyable. This suggests that IVR can be an effective pedagogical tool for learning about climate change. Furthermore, interest was found to predict knowledge (B = 0.532, p = .001), self-efficacy to predict intentions (B = 0.396,p = .033), and response efficacy to predict transfer (B = 0.208,p = .018), supporting claims that cognitive and affective factors drive the effectiveness of IVR. No significant differences were found in the effectiveness of the pedagogies, which might suggest boundary conditions of how and when to apply these pedagogies in IVR, calling for more research on when and how they are effective.

Meta-re-analyses of cross-cultural learning strategies in higher education
Keywords: Higher Education, Learning Approaches, Learning Strategies, Multicultural Education
Presenting Author: Alex Shum, The University of Hong Kong, Hong Kong; **Co-Author:**Luke Fryer, University of Hong Kong, Hong Kong; **Co-Author:**Jan Vermunt, Eindhoven University of Technology, Netherlands; **Co-Author:**Clara Ajisuksmo, Atma Jaya Catholic University of Indonesia, Indonesia; **Co-Author:**Francisco Cano-Garcia, University of Granada, Spain; **Co-Author:**Vincent Donche, University of Antwerp, Belgium; **Co-Author:**Dennis Law, Caritas Institute of Higher Education, Hong Kong; **Co-Author:**Reinaldo J. Martínez-Fernández, Universitat Autónoma de Barcelona, Spain; **Co-Author:**Peter Van Petegem, University of Antwerp, Belgium; **Co-Author:**Ji Yu, Tsinghua University, China

Research investigating the use of processing and regulation strategies across different cultures can shed light on the internationalisation of teaching and learning. Previous cross-cultural studies investigated limited representative samples and relied on geographical stereotypes. Published and unpublished ILS (Inventory of Learning patterns of Students) learning strategy datasets (eight total, seven countries, n=4882) were (re-)analysed. Hofstede's individualism-collectivism (IDV), and power-distance (PDI) country-level indices were employed as cultural indicators. Variable-centred and person-centred (Latent Profile Analysis; LPA) analyses confirmed that contexts corresponding to higher-power-distance and lower-individualism index values reported greater mixed use of meaning-directed and reproduction-directed strategies. Sample-level LPAs revealed different patterns and preferred processing and regulation strategies among profiles of higher-individualism, and lower-power-distance contexts. Four subgroups were found across a mass-LPA over all datasets: Versatile-Achievement, Meaning-Application, Reproduction, Undirected-Problematic. Substantial membership of "Western" countries in Versatile-Achievement subgroup questions the validity of geographical (e.g., Asian) learner stereotypes. Implications are discussed.

Effects of Augmented Reality on knowledge acquisition in learning eye diseases: A mixed-method study
Keywords: Educational Technologies, Immersive Technologies for Learning, Mixed-method Research, Simulation-based Learning
Presenting Author: Juming Jiang, The University of Hong Kong, Hong Kong; **Co-Author:**Anakin Chu Kwan Lai, The University of Hong Kong, Hong Kong; **Co-Author:**Yau Kei Chan, The University of Hong Kong, Hong Kong

With limited manpower and the impact of the COVID-19 pandemic, there is an urgent need for medical schools to integrate new pedagogical methods into the curriculum to maximize teaching and learning efficacy. Augmented reality (AR) technologies could provide opportunities for students to experience how patients feel living with the disease and the inconvenience that comes with it, which could help students gain a deeper understanding of diseases and the difficulties that patients might face in daily life. However, the use of such technologies is still limited in general medical education, not to mention those that are specifically focusing on teaching about eye diseases. To fill in such a gap, present research used a newly developed AR programme that can simulate the visual symptoms of various eye diseases, and examined its effect on medical students' knowledge acquisition in learning visual symptoms of eight eye diseases in a quasi-experimental setting. Fifty-three undergraduate students from healthcare-related disciplines in a university in Hong Kong without receiving any education relevant to visual symptoms of eye diseases participated in the study. Results show that AR intervention in present research had a large effect on knowledge acquisition in all eye diseases, and the majority of participants had a good understanding of patients' difficulties after the AR intervention. With a careful longitudinal experimental design in the future, more potentials of this AR application could be discovered.

Learning Factories as new Learning Environments in Vocational Education and Training
Keywords: Educational Technologies, Learning Approaches, Simulation-based Learning, Vocational Education and Apprenticeship Training
Presenting Author: Sebastian Anselmann, University of Education Schwäbisch Gmünd, Germany; **Co-Author:**Uwe Faßhauer, University of Education Schwäbisch Gmünd, Germany; **Co-Author:**Lars Windelband, Karlsruhe Institute of Technology (KIT), Germany

Learning factories function as complex simulations of real work and production processes, and in particular in order to be able to develop vocational competencies in an "Industry 4.0 typical" skilled work. In this context, learning factories represent cyber-physical systems that are to be designed at vocational schools as both a traditional learning space (learning lab) and a virtual/digital learning space ("digital twin"). This proposal reflects on learning spaces and the development of learning factories in vocational education in Germany, with the aim of laying a first scientific foundation for an explorative descriptive survey on learning factories. Learning factories are considered promising and methodologically highly complex learning spaces, whose components and applications have nevertheless hardly been empirically and comprehensively studied. The instrument presented here represents a first step in successively descriptive and investigative research on learning factories in vocational schools. With 41 items in an online based descriptive questionnaire, the main part of the survey aims at the design of the learning factories, didactic-methodical implementation in the learning process, the process design of the learning factory as well as the degree of digitalization. Within the scope of the survey, the lead actors of each vocational school learning factory were specifically interviewed. In the nationwide survey 75 vocational schools with learning factories took part.

A computerized linguistic analysis of sociomoral language in students' Flipgrid videos
Keywords: Citizenship Education, Developmental Processes, Educational Technologies, Emotion and Affect
Presenting Author: Ziye Wen, The Ohio State University, United States; **Co-Author:**Tzu-Jung Lin, The Ohio State University, United States; **Co-Author:**Michael Glassman, The Ohio State University, United States; **Co-Author:**Shantanu Tilak, The Ohio State University, United States; **Co-Author:**Wonjoon Cha, The Ohio State University, United States; **Co-Author:**Yue Sheng, The Ohio State University, United States; **Co-Author:**Saetbyul Kim, The Ohio State University, United States; **Co-Author:**Monica Lu, The Ohio State University, United States

In this study, we used a computerized text analysis tool to understand the use of logic-oriented language, emotion-oriented language, and sociomoral language derived from 662 Flipgrid videos produced by 120 fourth and fifth graders in social studies classrooms using Flipgrid is an online video-based discussion platform resembling an education version of video-based social media platforms, and was designed to facilitate asynchronous video-based social interactions focusing on complex social issues. In accordance with Eisenberg and Vygotsky's ideas on the role of cognition/logic and emotion in sociomoral development, we explored how the use of logic- and emotion-oriented language predicted the use of sociomoral-oriented language, and the interaction effect of developmental levels on logic- and emotion-oriented language use. Results showed that fifth graders benefited more by involving logic-oriented language into reasoning to proceed with sociomoral topics than fourth graders, while emotion-oriented language played a supportive role in use of spoken sociomoral language irrespective of grade level. Our analysis provided insights into the mechanisms behind spoken expression to highlight the social nuances of such forms of communication. The current findings present our measurement efforts for validating corpus-based indices of logic-oriented, emotion-oriented, and sociomoral languages in social studies classrooms, and for understanding how to design multimodal technology-assisted social studies curricula spurring sociomoral reasoning.

Learning from dialogues and video annotation: A design experiment in teacher education.
Keywords: Dialogic Pedagogy, Educational Technologies, Higher Education, Social Aspects of Learning and Teaching
Presenting Author: Anki Strom, University of South-Eastern Norway, Norway

Teacher students comprise an increasingly diverse student population, that bring a plurality of cultural and linguistic backgrounds into the university. This means that opportunities to meaningfully relate to an advanced academic discourse is unequally distributed among the students. This study addresses this issue by investigating how social organization and technology may support teacher students' argumentation skills. We explore the use of a video annotation tool that allows first-year teacher students to connect situated actions in video clips to relevant concepts in course literature. The findings show how students interact with the video annotation tool and how and if the activity contributes to support relevant reasoned argumentation.

Session C 25

22 August 2023 17:15 - 18:45
UOM_R03
Poster Presentation
Assessment and Evaluation, Higher Education, Learning and Special Education, Teaching and Teacher Education

Inclusive and Special Education and Learning

Keywords: Achievement, Assessment Methods, At-risk Students, Attitudes and Beliefs, Educational Policy, Higher Education, Inclusive Education, Mathematics/Numeracy, Primary Education, Quantitative Methods, Researcher Education, Secondary Education, Self-efficacy, Special Education, Teacher Effectiveness, Teacher Professional Development
Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education
Chairperson: Tessa van Schijndel, University of Amsterdam, Netherlands

The implementation of formative assessment in inclusive mathematics instruction
Keywords: Assessment Methods, Inclusive Education, Mathematics/Numeracy, Secondary Education
Presenting Author: Kyra Renftel, Leuphana University Lueneburg, Germany; **Presenting Author:**Fynn Töllner, Leuphana University of Lueneburg, Germany; **Co-Author:**Michael Besser, University of Lueneburg, Germany; **Co-Author:**Poldi Kuhl, Leuphana Universität Lüneburg, Germany

Successfully implementing frequent diagnostics and feedback of students' individual and heterogeneous learning processes as central element of formative assessment has become a major issue in (inclusive) education. Based on this, the current paper presents and discusses the results of six expert interviews with teachers of inclusive education at secondary school in Germany, exploring questions about the implementation of diagnostics to accompany the learning process and feedback to promote learning in inclusive mathematics classrooms. The results show that there is a major lack in the implementation of such diagnostics and feedback, underscoring the importance of appropriate materials to support teachers' diagnostics and feedback skills.

The 'ToPPERS' framework of effective teaching principles in prevocational education
Keywords: At-risk Students, Inclusive Education, Secondary Education, Teacher Effectiveness
Presenting Author: Charlotte Arnou, KU Leuven (BE), Belgium; **Presenting Author:**Heline Van Peteghem, Vrije Universiteit Brussel, Belgium; **Co-Author:**Nadine Engels, Vrije Universiteit Brussel (VUB), Belgium; **Co-Author:**Ingeborg Placklé, Vrije Universiteit Brussel, Belgium; **Co-Author:**Machteld Vandecandelaere, KU Leuven, Belgium

Since basic literacy is an essential skill for active participation in society and working life, it is problematic that many learners do not reach basic literacy levels. Furthermore, the increasing diversity of students entering prevocational education creates a challenging context for teachers. In order to effectively educate low-achieving, struggling students, a powerful learning environment (PLE) is crucial. Currently, knowledge on the characteristics of PLEs in prevocational education is lacking. The aim of this study was to close this knowledge gap using a best fit framework synthesis as a systematic literature review to identify important teaching principles that empirical research has shown to be effective in designing PLEs for prevocational education. The systematic review resulted in a framework: Teaching Principles for Powerful Education for sTruggling Students (ToPPERS). ToPPERS consists of twelve principles, categorised into three separate gears that a teacher and their team can use to create PLEs for struggling students in prevocational education. The first gear represents the importance of 'A safe, supportive and positive learning environment', where the student and the class group are at the centre of learning and teaching. The second and third gears illustrate that the 'teacher as a facilitator' and 'the teacher team' are key to get the gears turning. It is important to acknowledge that each principle is mutually dependent and cannot be separated from each other. Furthermore, the gears move in a systemic way, meaning that if one moves, all move, but if one stops moving, the others are hindered as well.

Whole Person Research Productivity: Towards a More Equitable Higher Education Research Environment
Keywords: Educational Policy, Higher Education, Inclusive Education, Researcher Education
Presenting Author: Crishana Benton, University of North Florida, United States; **Co-Author:**Daniel Dinsmore, University of North Florida, United States

There is increasing interest about the experiences of academics within the higher education space. Previous efforts surrounding faculty issues have centered on research productivity (e.g., Ramsden, 1994). However, with the emerging need to ensure representation for diverse student populations, we reimagine Ramsden's initial definition of productivity. Even greater significance for this study is held in a time of educational uncertainty and instability with a nationwide shortage of educators at all levels in the United States. To recruit and retain faculty of color, predominately white institutions (PWI's) faculty must examine their gatekeeping mechanisms. Given that departmental research productivity often holds major significance for an institution's overall ranking, we wanted to explore if and how research productivity might act as one of these gatekeeping mechanisms.

An individual behavioral intervention in Finland and Greece: A single case experimental study
Keywords: Inclusive Education, Primary Education, Quantitative Methods, Special Education
Presenting Author: Mika Paananen, University of Jyväskylä, Finland; **Presenting Author:**Henrik Husberg, University of Helsinki / Niilo Mäki Institute, Finland; **Co-Author:**Anne Karhu, University of Eastern Finland, Finland; **Co-Author:**Athanasios Gregoriadis, Aristotle University of Thessaloniki, Greece; **Co-Author:**Sara Pöntinen, Niilo Mäki Institute, Finland; **Co-Author:**Hannu Savolainen, University of Eastern Finland, Finland

This single-case experimental design (SCED) study aimed to explore the effectiveness of the CICO intervention for students with problem behavior in the Finnish and Greek educational context. Also, the usability of CICO intervention was evaluated. CICO intervention was the first level individual support for the students who did not achieve the behavioral goals set for the universal support. This study is part of larger school-wide positive behavior support (SWPBS) interventions in four European countries.Participating schools from the two countries (N=8) had developed their universal level PBS practices, defined behavioral expectations and trained teachers to use positive behavior specific praise. This study describes the efficacy of the CICO intervention as the first level individual support for 12 participants, mostly with aggressive, noisy, impulsive, and hyperactive behavior. Baseline and intervention phase data were collected and evaluated in a series of single-subject AB designs. During baseline and intervention phases, teachers used daily report cards to assess students' progress in individually defined behavioral goals. The intervention lasted 7-11 weeks. Both visual and statistical analyses were conducted. Visual inspection, and Tau-U values as effect sizes from the daily data showed that all participants improved their behavior in the expected direction. However, according to Tau calculations, not all results indicated a statistically significant intervention effect. Social validity and fidelity ratings indicate good usability of the CICO intervention in both countries. This study shows encouraging results, suggesting that CICO support is potentially effective intervention in multitiered PBS schools in European cultural contexts.

School inclusion 2014 and 2022: How do teachers' behavioral intentions and attitudes change?
Keywords: Attitudes and Beliefs, Inclusive Education, Self-efficacy, Teacher Professional Development
Presenting Author: Henrike Mentel, WWU Muenster, Germany; **Co-Author:**Natalie Foerster, University of Münster, Germany; **Co-Author:**Elmar Souvignier, University of Muenster, Germany

A major structural change in the German school system in the last decade concerns the realization of the UN-CRPD and the inclusion of children with special needs in the classroom. Teachers' individual characteristics play a crucial role for inclusive behavior and realizing inclusion in schools (e.g. Savolainen et al.,

2012) as well as school conditions (e.g. Woodcock & Woodcock, 2019). School conditions for implementing inclusion have changed in recent years (Gasterstädt, 2021; Klemm, 2022), which in turn seems to affect teachers' characteristics (Urton et al., 2014). We used the Theory of Planned Behavior (Ajzen, 1991) to investigate teachers' attitudes, subjective norm, self-efficacy and behavioral intentions in inclusive contexts. This study examines changes in the TPB predictors, changes in their relationship with the behavioral intention and the influence of school conditions. In an online survey, teachers were asked about their attitudes, subjective norm, self-efficacy, behavioral intentions and school conditions. We compare data with same measures from 2014 and 2022 (data collection ongoing). 2014 attitudes (M=2.44), subjective norm (M=2.88) and self-efficacy (M=2.60) were found to be in the mid-range of scales. Attitudes significantly predicted the behavioral intention (β=.60), which in turn was influenced by schools' environmental, financial/personal resources (β=.36) and cooperation (β=.29). Temporal changes will be investigated using a multi-group latent SEM analysis. The results will provide valuable input for interventions and shed light on the influence of external conditions on behavioral intentions and their predictors.

Do you Belong at your University? Belongingness and Authenticity in Higher Education
Keywords: Achievement, Higher Education, Inclusive Education, Quantitative Methods
Presenting Author: Anne-Roos Verbree, University Medical Center Utrecht, Netherlands; **Co-Author:**Gönül Dilaver, University Medical Centre Utrecht, Netherlands; **Co-Author:**Leoniek Wijngaards-de Meij, Utrecht University, Netherlands; **Co-Author:**Marieke van der Schaaf, University Medical Center Utrecht / Utrecht University, Netherlands

Higher education students differ in their sense of belonging, which means the extent to which they feel comfortable in the classroom and experience support from faculty members and their peers. Underrepresented students may have less sense of belonging. However, it is currently unclear which student groups experience less sense of belonging than their peers. It is also unclear whether students experience that other students value their uniqueness or authenticity. This is important as sense of belonging and authenticity may impact student performance and functioning. This study employs a survey research design and, using a large sample of university students, comprehensively examines students' sense of belonging and authenticity based on multiple student characteristics. This includes students' gender, sexual orientation, ethnic background, religion, disabilities, parental education, whether a student is a member of a (student) organization, study phase, and major. In addition, it is examined whether students' sense of belonging and authenticity are related to self-reported academic achievement. Research is relevant both to address the gaps in the literature on sense of belonging and to provide practitioners in higher education with insights into which student groups may need extra attention to make them feel at home and be successful in higher education. Eventually, this may increase equality in educational opportunities for *all* students.

Session C 26

22 August 2023 17:15 - 18:45
UOM_GYM
Roundtable
Learning and Instructional Technology

E-learning and Online Learning

Keywords: Achievement, Comprehension of Text and Graphics, Critical Thinking, E-learning/ Online Learning, Instructional Design, Learning Analytics, Pre-service Teachers, Self-regulated Learning and Behaviour, Synergies between Learning / Teaching and Research, Teaching/Instructional Strategies, Tool Development
Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 27 - Online Measures of Learning Processes
Chairperson: Burcu Arslan, Netherlands

Balancing educational theory and teacher's input in designing teacher dashboards.
Keywords: Learning Analytics, Self-regulated Learning and Behaviour, Synergies between Learning / Teaching and Research, Tool Development
Presenting Author: Susan Janssen, Radboud University Nijmegen, Netherlands; **Co-Author:**Carolien A. N. Knoop-van Campen, Radboud University Nijmegen, Netherlands; **Co-Author:**Anouschka van Leeuwen, Utrecht University, Netherlands; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands

Artificial intelligence (AI) is reshaping the world in profound ways, including education. Technology has found its way into the classroom through AI applications, such as adaptive learning technologies but also in teacher dashboards that make results from AI algorithms insightful for teachers. The design of these teacher dashboards has been increasingly influenced by both educational theory and the input of stakeholders (teachers). These two views can complement each other. For example, educational theory can guide the design process by providing knowledge of theory and teachers can share their professional knowledge and experiences. However, when input from educational theory and stakeholders is integrated into the design process, potential tension may arise when this input leads to different insights for the teacher' dashboard design. This creates challenges in the co-design process of teacher dashboards. Given that the degree of usability of the dashboard depends on the balance between educational theory and the input of teachers, this roundtable aims to discuss good practices for co-design of teacher dashboards. During the round table, we will present our first experiences with these challenges in the co-design process of an SRL teacher dashboard and invite participants to share their best-practices.

Teaching information evaluation in self-paced e-learning mode: is distributed practice helpful?
Keywords: Comprehension of Text and Graphics, Critical Thinking, E-learning/ Online Learning, Self-regulated Learning and Behaviour
Presenting Author:Mônica Macedo-Rouet, CY Cergy Paris Université, France; **Co-Author:**Jean-Marc Meunier, Université Paris 8, France; **Co-Author:**Anna Potocki, Université de Grenoble, France; **Co-Author:**Jean-Francois Rouet, University of Poitiers, France

For two decades, higher education institutions have developed innovative forms of distance learning, banking upon the affordances of the Web 2.0 for online information access, networking and communication. At the same time, the spread of misinformation on the internet has increased the need to educate students for a critical appraisal of information quality and credibility online. The present study investigates the efficiency of an intervention on information evaluation delivered in self-paced e-learning mode to undergraduate students enrolled in a distance education program. Participants complete two interactive modules and practice exercises with partly automated feedback, via a Moodle course page and a dedicated platform, self-regulating their time on tasks. We expect distributed practice to be positively associated with evaluation performance in the intervention group compared to a business-as-usual condition. Data were being collected at the time of submission.

Supporting teachers' interpretation of multimodal learning analytics to assess student engagement
Keywords: Learning Analytics, Pre-service Teachers, Self-regulated Learning and Behaviour, Teaching/Instructional Strategies
Presenting Author: Megan Wiedbusch, University of Central Florida, United States; **Co-Author:**Roger Azevedo, University of Central Florida, United States

Educators must adapt and improvise their instruction for each student's unique needs and capabilities across contexts by observing their students, evaluating their ongoing learning, and offer individualized scaffolding and feedback to foster sustained growth and development. The recent emphasis for data-driven instructional decision making further requires teachers to become both pedagogical and data experts who are capable of navigating and utilizing teacher dashboards to do so. While dashboards are increasing in popularity, we emphasize the need to understand educator data literacy and how educators are currently approach multimodal learning analytics (MMLA) that report on more than just performance-based outcomes. That is, are teachers capable of utilizing the sophisticated data visualization and analytics researchers are developing? And if so, under what conditions do they consult these visualizations and analytics to make real-time decisions about their instruction? In this on-going work, we describe the development of an in-progress study exploring how teachers currently use fictious MMLA on self-regulated learning (SRL) processes to interpret levels of student engagement and the emerging trends we see from their data. Finally, we postulate what these results suggest about the needs that embedded intelligent pedagogical companions may fill in future dashboard and agent design.

Selecting Didactic Templates for Optimizing Online Education
Keywords: Achievement, E-learning/ Online Learning, Instructional Design, Teaching/Instructional Strategies
Presenting Author: Emre Yilmazturk, Open University, Department of Online Learning and Instruction, Netherlands; **Co-Author:**Kevin Ackermans, Open Universiteit, Department of Online Learning and Instruction, Netherlands; **Co-Author:**Desirée Joosten-ten Brinke, Open University of the Netherlands, Netherlands; **Co-Author:**Gino Camp, Open Universiteit, Department of Online Learning and Instruction, Netherlands

Much is known from research about how evidence-based pedagogy (such as activating relevant prior knowledge) supports the learning process and what the effects are on learning (e.g., Surma et al., 2019). However, this knowledge is not used by teachers in a systematic way to shape education, especially not in an online course setting (Rapanta et al., 2020). One way of promoting the systematic use of evidence-based pedagogy in educational courses is providing teachers with didactic templates (Dobbs et al., 2009). Didactic templates are preset formats that help teachers to choose and implement particular forms of evidence-based pedagogy for their online course(s) based on academic insights. Teachers using didactic templates can efficiently arrive at an evidence-informed course structure that will impact the quality of their online education (Roksa et al., 2017). During the roundtable, I will briefly present several forms of evidence-based pedagogy rooted in cognitive psychology. I will then discuss with the participants which of these are essential for designing evidence-informed didactic templates, and how their implementation in an online learning environment can make sense for teachers as course developers. The insights gained from the roundtable discussion will be used in further shaping and prioritizing the designs of didactic templates in our design-based research.

Session C 27

22 August 2023 17:15 - 18:45
UOM_A06
Workshop
Learning and Instructional Technology

ForgetNot – a digital tool for informing teaching and enhancing retention

Keywords: Educational Technologies, Engagement, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 14 - Learning and Professional Development

Student engagement in learning activities is essential for efficient learning and retention, and therefore one of the main focuses of educators. However, research indicates that around 23% of the class time students only pretend to be engaged in classroom activities (Fuller et al., 2018) and teachers do not have evidence about how much of the class time their students actually actively participate in the study tasks. Also, cognitive-science research on how students learn stresses the importance of distributed retrieval practices, which help to retain information in long-term memory. However, most of the school lessons are spent on learning (i.e. coding) new material, while little attention is paid to practices that help to retain the obtained material. This leads to mass learning and short-term retention, which helps to pass tests but is not sustainable in terms of mastering a topic or a subject. The ForgetNot tool was designed to address these problems to a certain extent. Namely, the tool provides possibilities for the collection of fast student feedback on their engagement in classroom activities, as well as enhances long-term retention, through providing possibilities for distributed retrieval practice, as it enables the distribution of (practice) test questions in smaller chunks on different days.

ForgetNot – a digital tool for informing teaching and enhancing retention
Presenting Author: Merike Saar, Tallinn University, Estonia

Student engagement in learning activities is essential for efficient learning and retention, and therefore one of the main focuses of educators. However, research indicates that around 23% of the class time students only pretend to be engaged in classroom activities (Fuller et al., 2018) and teachers do not have evidence about how much of the class time their students actually actively participate in the study tasks. Also, cognitive-science research on how students learn stresses the importance of distributed retrieval practices, which help to retain information in long-term memory. However, most of the school lessons are spent on learning (i.e. coding) new material, while little attention is paid to practices that help to retain the obtained material. This leads to mass learning and short-term retention, which helps to pass tests but is not sustainable in terms of mastering a topic or a subject. The ForgetNot tool was designed to address these problems to a certain extent. Namely, the tool provides possibilities for the collection of fast student feedback on their engagement in classroom activities, as well as enhances long-term retention, through providing possibilities for distributed retrieval practice, as it enables the distribution of (practice) test questions in smaller chunks on different days.

Session C 28

22 August 2023 17:15 - 18:45
UOM_A09
ICT Demonstration
Learning and Instructional Technology

Building Blocks: An adaptive online platform for foreign language literacy development

Keywords: Computer-assisted Learning, Foreign and Second Language Acquisition, Game-based Learning, Reading
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Please bring your own device if you are attending this ICT demonstration.Despite the importance of sound-letter connections in learning English as a foreign language, adaptive digital tools using marking cross-linguistic difficulties have not yet been developed for the foreign language learning environment. To remedy this issue, we have developed an integrated oline assessment instrument for (a) testing acquired spelling ability in line with local and national curricula; (b) creating data driven longitudinal developmental models for phonemic awareness acquisition; and (c) modeling motivational changes using the software tools. Software tools have been developed within Japan and Hong Kong in order to test sound-letter acquisition for both opaque and semi-transparent orthography L1 learners. This project aims to provide public elementary schools in Asia and beyond with a tool for improving motivation to read English by providing level appropriate sound-letter instruction.

Building Blocks: An adaptive online platform for foreign language literacy development
Presenting Author: Quint Oga-Baldwin, Waseda University, Japan; **Co-Author:**Luke Fryer, The University of Hong Kong, Hong Kong; **Co-Author:**Alex Shum, The University of Hong Kong, Hong Kong; **Co-Author:**Kaori Nakao, Seinan Gakuin University, Japan; **Co-Author:**Lishi Liang, The University of Hong Kong, China

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Session D 1

23 August 2023 08:00 - 09:30

AUTH_DC3
Invited Symposium
Learning and Instructional Technology

A Multi-Disciplinary Perspective on Immersive Virtual Reality Learning and Instruction

Keywords: Cognitive Skills and Processes, Ethics, Eye Tracking, Immersive Technologies for Learning, Instructional Design, Multimedia Learning, Pre-service Teachers, Self-regulated Learning and Behaviour, Simulation-based Learning
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Vincent Hoogerheide, Utrecht University, Netherlands
Organiser: Andreas Lachner, University of Tübingen, Germany
Organiser: Vincent Hoogerheide, Utrecht University, Netherlands
Organiser: Salome Wagner, University of Tübingen, Germany
Discussant: Tina Seufert, Ulm University, Germany

Virtual reality (VR) technology is increasingly being used in education to create immersive and interactive learning experiences. Despite technological advances and high hopes, the use of VR for educational purposes comes with serious challenges. For instance, immersive VR is not always that effective because its benefits depend on the degree to which the instructional design guidelines match the affordances of the technology. There are also important privacy considerations when people want to use VR in education. This symposium uses a multi-disciplinary perspective with the aim of optimizing the use and effects of using immersive VR for learning and instruction. The first two contributions focused on the student perspective. Johnson-Glenberg et al. (cognitive science perspective) had students manipulate content in immersive VR and examined whether metacognitive prompting would help students' self-regulated learning and learning outcomes. Effects on EEG and pupil dilation were explored. Plechatá et al. (instructional design perspective) examined if the effects of immersive VR on behavioral change depend on whether participants experienced climate change scenarios or were instructed about climate change by a virtual instructor. The third contribution by Huang et al. (teacher education perspective) focused on the teacher perspective, by using VR with an eye tracker to uncover preservice teachers' movement patterns and visual attention in immersive VR. Lastly, the contribution by Kasneci and Bozkir (computer science perspective) discusses the important issue of privacy in educational immersive VR settings. Theoretical and practical considerations are discussed.

Encouraging Learners in VR to be More Reflective and Metacognitive
Presenting Author: Mina Johnson, Arizona State University, United States; **Co-Author:**Shin-Phing Christine Yu, Department of Psychology, Arizona State University, United States; **Co-Author:**Anoosh Kapadia, School of Computing and Augmented Intelligence, Arizona State University, United States; **Co-Author:**Augustine Bennet, School of Speech and Hearing Sciences, Arizona State University, United States

The team at the Embodied Games Lab, with professors from the Mechanical and Structural Engineering departments, have created an engineering lesson in immersive virtual reality (VR) on Tuned Mass Dampers. Dampers are important to attenuate sway in tall buildings that can be excited by earthquakes. The phenomenon is three-dimensional and lends itself to learning in 3D immersive VR. Learners interact with multiple variables in an embodied manner (e.g., shaking a hand controller to create a sine wave that causes an earthquake). Learners explore variables and constraints on building design and damper mechanics. The content is abstract and complex. We know that giving learners metacognitive prompts aids them in comprehension; this has been seen in real-world small groups (Palincsar & Brown, 1984) and with educational videogames (Geden et al., 2020). The goal is to understand how encouraging learners to pause and reflect during the lesson will affect their knowledge gains and cognitive load. A randomized control trial with college students is being run. Undergraduate participants are assigned to either a control condition (low-agentic metacognitive room) or an experimental condition (high-agentic metacognitive room). Preliminary data on biometrics (EEG and pupil dilation) and learning gains will be presented. The hypothesis is that those who were active the three times they were teleported to the metacognitive room and created artifacts will show greater cognitive load, but also greater learning gains. This is in line with the desirable difficulties literature.

Impact of an Experience vs.Information-Based VR Educational Simulation on Green Behavior
Presenting Author: Adéla Plechatá, University of Copenhagen, Denmark; **Co-Author:**Marijke Hiltje Hielkema, Department of Food Science, University of Copenhagen, Denmark; **Co-Author:**Lisa Marie Merkl, Department of Marketing & Consumer Behaviour, University of Bayreuth, Germany; **Co-Author:**Michael Bom Frøst, Department of Food Science, University of Copenhagen, Denmark; **Co-Author:**Guido Makransky, University of Copenhagen, Denmark

Immersive virtual reality (VR) provides the possibility to experience educational content rather than just being passive recipients. In terms of environmental communication, such first-person interactive experiences can be more effective in increasing people's perceived behavioral control over the climate change consequences, i.e., efficacy beliefs, and consequently in promoting pro-environmental behavior (PEB). To study how such a shift from information-based to experienced-based education might change the environmental communication effectiveness, we randomly assigned $N = 167$ participants to a VR experience condition or VR information condition. In the VR experience condition, participants experienced and influenced future climate change scenarios based on their food choices while participants in the VR information condition received the same information from a virtual human. After the VR intervention, participants were offered a meal, and had to choose between three options: beef Bolognese, 50% reduced Bolognese, and vegetarian Bolognese. The VR experience condition led to higher intentions to reduce meat consumption ($r = .20$, $p = .011$) and more PEB in VR ($r = .17$, $p = .028$) and real life ($d = 0.32$, $p = .040$) as compared to the information condition. Mediation analyses confirm that experiential VR environmental education can increase people's efficacy beliefs, which increase their intentions and consequently leads to a reduction in beef consumption. These results indicate that VR interventions benefit from an instructional design that promotes experience-based, rather than verbal instruction in order to successfully increase users' efficacy beliefs and influence their real-life behavior.

Uncover Teachers' Movement Patterns in Immersive VR: Relevance for Visual Attention Performance
Presenting Author: Yizhen Huang, University of Potsdam, Germany; **Co-Author:**Eric Richter, University of Potsdam, Germany; **Co-Author:**Thilo Kleickmann, Kiel University, Germany; **Co-Author:**Dirk Richter, University of Potsdam, Germany; **Co-Author:**Katharina Scheiter, University of Potsdam, Germany

Movements and eye movements are closely linked when people navigate a space to perform tasks, such as teaching in a classroom. Teachers' movement characteristics may thus be related to their noticing of relevant classroom events, specifically visual attention to student disruptions in the current study. We investigated this question with an immersive virtual reality (IVR) classroom due to its ability to track both movement and eye movement in a standardized classroom environment. Based on time series data gathered during 21 preservice teachers' instructions, we conducted K-means clustering with movement features. Three distinctive patterns were identified which we labeled as immobile, anchored, and dynamic movement pattern. Dynamic teachers visited locations further away from the teacher's desk and spent less time dwelling in any location. Dynamic movement pattern was also associated with the best visual attention performance—number of fixations on and fixation speed to disruptions in the classroom. Our findings demonstrated that there are unique and differentiable movement patterns among preservice teachers that have implications for teacher noticing/professional vision, teacher–student interaction and instructional quality.

Privacy in Educational Virtual Reality: Challenges for Educational Practices
Presenting Author: Efe Bozkir, University of Tuebingen, Germany; **Co-Author:**Enkelejda Kasneci, Technical University of Munich, Germany

The recent advancements in sensor technologies and artificial intelligence have significantly impacted the utilization of virtual reality (VR) in education. Eye tracking, as an interaction technique, offers a non-invasive means of engagement as well as a deeper comprehension of human visual attention and cognitive processes in VR, facilitated by integrated eye trackers in head-mounted displays. Nonetheless, the employment of VR, especially with integrated eye-tracking, also raises privacy concerns. This contribution discusses recent research in the domains of eye tracking, VR, and privacy in education. With a special focus on eye-tracking in educational VR settings, we encompass current computational approaches to preserve the privacy of eye-tracking data in VR.

Session D 2

23 August 2023 08:00 - 09:30

AUTH_CH
Invited Symposium
Teaching and Teacher Education

Teacher learning about and through dialogue and argumentation

Keywords: Argumentation, Dialogic Pedagogy, In-service Teachers, Pre-service Teachers, Social Aspects of Learning and Teaching, Teacher Professional Development
Interest group: SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Christa Asterhan, Hebrew University of Jerusalem, Israel
Discussant: Fritz C. Staub, University of Zurich, Switzerland

Educational research provides robust theories and empirical findings about student learning through dialogue and argumentation and about the role of teacher facilitation and support of these processes. Yet, despite this impressive body of knowledge and numerous intervention programs that have tried to translate it into practice, dialogue and argumentation are still not commonplace in most classrooms. Research on professional development (PD) initiatives has traditionally focused on the effectiveness of particular PD designs to change classroom practice and student outcomes, but less so on the processes of teacher sensemaking and learning that mediate these associations (Horn & Garner, 2022). Thus, whereas teachers play a pivotal role and are the primary target of intervention and PD initiatives, as well as the ones who are expected to carry out the intended changes in practice, they are typically positioned as the “vehicles” (or obstacles) of change, rather than as the object of study. In this symposium, we propose that more focused research attention on teacher sensemaking processes while learning about argumentation and dialogue could provide important insights. This type of research requires the development of new conceptual frameworks for teacher learning, as well as adequate research methods and tools to capture different processes and outcomes. The four presenters in the present session each lead ongoing research and development efforts in this relatively new field of scholarly interest. They share their latest conceptual, methodological and empirical insights, while focusing on different professional learning settings and aspects. Fritz Staub will lead the discussion.

What’s wrong with professional development for dialogic teaching?
Presenting Author: Adam Lefstein, The Hebrew University of Jerusalem, Israel

Changing teaching practice is difficult. This difficulty is especially acute in the case of dialogic teaching, which intensifies the complexity of teaching, often requires shifts in teachers’ beliefs, and increases the demands on teachers’ skills, knowledge, flexibility and judgement. Developing dialogic teaching is therefore a formidable challenge for the individual teacher, and can sometimes appear an insurmountable task for educational improvers who seek to enact dialogic teaching in a sustainable manner and on a wide scale. In this conceptual paper I discuss the challenges dialogic teaching poses for teachers, schools and systems, and the strengths and shortcomings of popular teacher professional development designs for addressing these challenges. I argue for an approach to professional development for dialogic teaching that emphasizes the development of epistemic and social infrastructures to support teacher learning and practice, routines for ongoing discussions of problems of practice, and mutual adaptation of program designs.

Developing transformative tools for teacher and classroom dialogue for learning
Presenting Author: Riikka Hofmann, University of Cambridge, United Kingdom

While research suggests that dialogic pedagogy drawing on students’ ideas can improve learning outcomes, changing practice is often challenging even after effective teacher professional development, hindering scalable change. Research identifies several key mechanisms that hinder change towards more dialogic classroom practices. Teachers often hold deficit models of students, assuming dialogic ideas will not work in their setting, stopping them from trying those. Classroom practices are also strongly shaped by sociocultural norms which extend beyond individual teachers and can distort change or make it superficial. Besides, teachers' perceptions of accountability can also enact against implementing dialogic practices. This presentation will discuss the nature of these barriers and share insights from our research of ways to overcome them through effective professional learning. The presentation will examine and illustrate the need for teacher professional dialogues as a source of learning. Productive professional dialogues which can support change in classroom interactive practices will need to consider the following: Firstly, expanding teachers’ conceptualisations of students through Reflexive noticing (Rainio & Hofmann, 2021); secondly, focusing on the invisible classroom norms and their role in enabling change (Hofmann & Ruthven, 2018); and finally, scaffolding practitioners in articulating desired outcomes to link dialogic practices with existing accountabilities (Hofmann & Ilie, 2021). The presentation will conclude by illustrating a learning tool which embodies these research findings.

Arguments about Facilitating Argumentation: Teachers’ Schemas about Dialogic Pedagogy
Presenting Author: Sherice Clarke, University of California, San Diego, United States; **Co-Author:**Sushil S, University of California San Diego, United States; **Co-Author:**Katherine Dennis, University of California San Diego, United States

Teachers play a critical role in creating meaningful opportunities to learn through science discussions. Prior work has highlighted the challenges in supporting development of teachers’ knowledge of argumentation and transformation of pedagogical practice as a consequence. In this paper we report on data from a 5-year design-based research project that focuses on supporting teacher growth in facilitating science discussions. Focus particularly on *teachers’ schemas*, we focus on teachers’ sensemaking and decision making about facilitating science argumentation discussions. These are the logical reasoning that tethers what is salient about practice in reflections, what meanings they make from representations of practice and decision making in practice. We examine teachers’ schemas in the context of professional development and their instantiation in their classroom facilitation of science discussion. The findings highlight the ways in which teachers’ schemas and ideologies are a substrate for professional learning, and an opportunity for design for professional development.

Promoting productive classroom talk in teacher interventions – A matter for pre-service teachers?
Presenting Author: Alexander Groeschner, Friedrich Schiller University Jena, Germany

Productive classroom talk is a pedagogy that breaks away from interaction patterns that are predominantly steered by the teacher, focusing instead on a classroom culture in which students respect one another and move beyond the boundaries of their own thinking and understanding. To support this, teachers need a broad talk-based repertoire which Alexander (2018) refers to as dialogic teaching. Surprisingly, most research in the field comes from in-service teacher education and has not yet considered learning opportunities in pre-service teacher education. This presentation will bridge the rich evidence from professional development programs and recent approaches to promote productive classroom talk and dialogic teaching in pre-service teacher education. For this purpose, recent studies from the "Learning-to-Teach Lab: Science" (LTL:S) are presented in which we promote productive classroom talk and dialogic teaching in teacher interventions during a teaching practicum. In Study 1, the findings show positive changes in pre-service teachers' knowledge about productive classroom talk; Study 2 reveals a positive change in pre-service teachers' attitudes toward dialogic teaching. Furthermore, a training program is illustrated focusing on pre-service teachers' performance of dialogic teaching as an approximation of practice (Grossman et al., 2009). Challenges and avenues for future research and practice are discussed.

Session D 3

23 August 2023 08:00 - 09:30
HELEXPO_CC
Invited Symposium
Cognitive Science

How learning and education shape the brain

Keywords: Cognitive Development, Cognitive Skills and Processes, Developmental Processes, Educational Neuroscience, Learning and Developmental Difficulties, Mathematics/Numeracy, Reading, Science and STEM
Interest group: SIG 22 - Neuroscience and Education

Chairperson: Dietsje Jolles, Universiteit Leiden, Netherlands
Chairperson: Stephan Vogel, University of Graz, Austria
Discussant: Bert De Smedt, KU LEUVEN, Belgium

How we learn is influenced by the way our brain processes information. However, we often overlook that these brain processes are themselves shaped by the things we learn and experience, both inside and outside of formal education. Thus, to fully appreciate the mechanisms of learning and how the brain impacts learning, we need to implement a systematic, bi-directional approach that captures the dynamics of the learning brain. Over the past two decades, a growing body of research has provided significant insights of how brain structure and function change as we acquire cognitive and academic skills. Findings from diverse domains including reading, mathematics, and science have indicated that the sensitivity and specificity of domain-general and domain-specific brain regions increase with training and experience.
The SIG-22 symposium aims to further explore the dynamic interaction between learning and brain development by investigating different mechanisms of change, individual differences in receptivity to cognitive and academic interventions, and differences in learning trajectories. Using diverse approaches (e.g., large-scale randomized controlled trials, dense-sampling longitudinal data collection) and methodologies (e.g., academic and cognitive assessment, fMRI, EEG, genetic analysis), the invited authors will discuss training of domain-specific skills (e.g., reading), domain-general skills (e.g., executive functions), and a combination of both (e.g., executive functions in the context of reading, math, and science). Taken together, the SIG-22 symposium will provide novel and crucial insights into the mechanisms underlying (individual differences in) successful learning and holds great promise for a critical discussion on the dynamic interaction between learning and (brain) development.

How reading instruction shapes brain responses in individual children
Presenting Author: Alexander Enge, Max Planck Institute for Human Cognitive and Brain Sciences, Germany; **Co-Author:**Michael Artur Skeide, Max Planck Institute for Human Cognitive and Brain Sciences, Germany

While the educational sciences have gathered substantive knowledge about how to best teach children to read, little is known about the neural underpinnings of this developmental process. We use a dense-sampling longitudinal approach based on functional magnetic resonance imaging (fMRI) to track how literacy instruction changes brain responses to written and spoken words in individual children. For this purpose, a reading instruction group and an active control group consisting of children from rural areas in northern India (n = 15 each) participate in bi-monthly fMRI scanning and behavioral testing sessions. Single subject statistical modeling and Bayesian prevalence estimation reveals that reading instruction enhances phonological and semantic brain responses These findings provide a detailed picture of how teaching children to read influences their brain activity, with implications for individualized and neurobiologically motivated teaching methods.

Synchronizing the brain: an executive functions-based reading program for children with dyslexia
Presenting Author: Tzipi Horowitz Kraus, Technion - Israel Institute of Technology, Israel

Dyslexia, a developmental reading difficulty, is characterized by slow and inaccurate reading, which continues into adulthood, despite repeated exposure to literacy. One of the theories explaining the causes of the lack of reading fluency in dyslexia is the asynchrony theory, suggesting that a lack of synchronization between the auditory and visual modalities underlies their reading difficulty. In this talk, findings from training with an executive-functions-based reading program, based on the speed of processing, visual attention, working memory and inhibition among 8-12 y.o children with dyslexia and typical readers, will be shared. Findings suggest that improved reading fluency in children with dyslexia was associated with improved executive functions as well as greater involvement of neural circuits supporting visual and auditory modalities as well as executive functions. The results of these studies point at the central role of executive functions in reading fluency, an important component of the reading process (see also the Simple View of Reading model). It may also suggest that this specific executive-functions-based reading intervention increases the synchronization between the auditory and visual modalities by engaging executive functions. Doing that, it may reduce the neural noise in children with dyslexia.

Stop & Think: development and evaluation of a primary school-based maths and science intervention
Presenting Author: Lucy Palmer, Birkbeck College, University of London, United Kingdom; **Co-Author:**Iroise Dumontheil, Birkbeck, University of London, United Kingdom

Science and mathematics learning requires the integration of new evidence about the world into one's existing theories. In science education, it can be a real challenge for children to acquire knowledge that goes beyond popular beliefs or perception. Behavioural and neuroimaging research suggests that old theories remain even when new ones are learnt, and inhibitory control is thought to allow the suppression of incorrect intuitive concepts. Building on this research, the 'Stop & Think' intervention was designed to encourage children to use their inhibitory control skills when solving potentially counterintuitive science and mathematics problems. The computerised intervention was delivered by teachers and evaluated in a large-scale randomised controlled trial in 7–8 and 9–10-year-old children. The trial showed improvements in performance of standardised mathematics and science tests in 9–10-year-olds when Stop & Think was compared to an active training intervention focusing on socio-emotional skills. While these results are promising and are consistent with the proposed role of inhibitory control in science and mathematics reasoning, further analyses in subsamples with cognitive and neuroimaging data were not able to provide clear evidence of the mechanism of impact of the intervention.

Cognitive, genetic and cerebral factors influencing learning to stop in childhood
Presenting Author: Grégoire Borst, Université Paris Cité - CNRS, France

Executive functions (EFs) – including inhibitory control (IC) are important for academic achievement as well as physical and mental health. A number of cognitive training programs have tested the possibility to improve EFs and have reported in some cases transfer to academic learning. Different behavioral, brain and genetic factors contribute to the receptivity of cognitive training, including the basal cognitive level, the activity and anatomy of the brain, in particular in the prefrontal cortices, and genetic factors in particular in the dopaminergic system. Each of these factors tend to be considered individually providing only a limited comprehension of the rich interplay between these different factors in explaining individual variability in IC receptivity. The present study aimed to do so by investigating the genetic, cerebral and cognitive factors contributing to inhibitory control training receptivity in 57 ten-years-of-age children after a 5-weeks computerized training. Using Structural Equation Modeling and Latent Change Models, we found that the Polygenic Risk Score (PRS) predicted not only IC efficiency before training but also improvement in IC efficiency. In addition, the left Anterior Cingulate Cortex (ACC) volume at pretest and the change in ACC volume due to training were both related to change in IC efficiency due to training. Thus, IC training receptivity seems to be under both genetic and cerebral factors each contributing to different part of the variability of the improvement in IC efficiency.

Session D 4

23 August 2023 08:00 - 09:30
UOM_CR
Symposium
Instructional Design

The Role of Prior Knowledge in Learning

Keywords: Achievement, Cognitive Skills and Processes, Computer-assisted Learning, Inquiry Learning, Instructional Design, Knowledge Construction, Large-scale Assessment, Mathematics/Numeracy, Primary Education, Quantitative Methods, Reading, Science and STEM
Interest group: SIG 06 - Instructional Design, SIG 20 - Inquiry Learning
Chairperson: Thomas Simacek, University of Trier, Germany
Organiser: Thomas Simacek, University of Trier, Germany
Discussant: Patricia Alexander, University of Maryland, United States

Prior knowledge affects basic knowledge acquisition processes in all content domains and educational contexts. For example, it determines the comprehension of new information, serves as a resource for problem-solving processes, and directs attention. These are reasons why researchers have suggested that prior knowledge may be of the strongest determinants of learning. Recent meta-analyses and reviews highlighted that the effects of prior knowledge on knowledge acquisition processes are heterogeneous. This makes it difficult to predict how prior knowledge affects learning in particular educational settings. Therefore, it is important to better understand the complexity of the underlying mechanisms in learning that are elicited by prior knowledge. This symposium aims to address the influences of prior knowledge on knowledge acquisition from different but interrelated perspectives. Among the presentations are three field studies and one bibliometric analysis. The four contributions comprise research on individual differences, attributes of knowledge elements, instructional methods, and the research literature on prior knowledge. The field studies investigate the role of prior knowledge in understanding fractions, acquiring advanced concepts in physics, and generating sophisticated hypotheses. Participants were secondary school students who attended STEM classes and received analog or digital instruction. The bibliometric analysis covers research on prior knowledge in various fields from approximately 40 years and provides a comprehensive overview of popular and less addressed topics. Combining the findings presented in the symposium leaves room for discussions on the effects of prior knowledge on learning as well as approaches for future prior knowledge research.

Prior knowledge in inquiry learning
Presenting Author: Tessa Eysink, University of Twente, Netherlands; **Co-Author:**Xiulin Kuang, University of Twente, Netherlands; **Co-Author:**Ton de Jong, University of Twente, Netherlands

We present two studies on the relation between prior knowledge and hypothesis generation during inquiry learning. In the first study, the aim was to investigate whether presenting students with basic domain knowledge and/or giving them the opportunity to do exploratory experiments could provide them with the necessary prior knowledge to work effectively in an inquiry-based learning environment. In the second study, the aim was to investigate whether adapting the level and amount of domain information to students' prior knowledge facilitated their performance. Performance was measured by the quality of students' hypothesis generation processes, the quality of the subsequent inquiry learning processes, and their knowledge acquisition. 118 and 69 secondary school students respectively, participated in three experimental sessions in which they worked with an online inquiry learning environment on the physics domain of force and motion. Coding schemes were created to assess students' inquiry learning processes. Knowledge acquisition was measured with a pre- and post-test. Results showed that students' prior knowledge on relevant variables was enhanced by merely providing domain information, but that this did not further result in better performance on hypothesis generation or subsequent inquiry processes. Moreover, adapting this domain information to the prior knowledge level of the students did benefit the quality of hypothesis generation, but it did not affect their knowledge acquisition.

Studies on Prior Knowledge in Learning: A Comprehensive Bibliometric Analysis
Presenting Author: Michael Schneider, University of Trier, Germany; **Co-Author:**André Bittermann, Leibniz-Institute for Psychology Information (ZPID), Germany; **Co-Author:**Danielle McNamara, Arizona State University, United States; **Co-Author:**Bianca Simonsmeier, University of Trier, Germany

The knowledge is power hypothesis describes knowledge as one of the most potent predictors of learning. Research on prior knowledge is manifold. Cognitive scientists investigate the underlying processes in experiments. Developmental psychologists analyze how prior knowledge predicts trajectories of learning in longitudinal studies. Educational researchers develop interventions to activate and utilize prior knowledge or to compensate for detrimental effects of low prior knowledge. Researchers investigate the roles of prior knowledge in perception, attitude formation, racism, work performance, patient education, and many other fields. The size and breadth of these literature strands make it nearly impossible for researchers to keep track of all of them. In the present study, we used a bibliometric analysis to provide a comprehensive overview of prior knowledge research from a birds-eye perspective. A standardized search yielded 13,507 relevant studies. The studies investigated 23 topics that formed a network of five interrelated communities: Education, Learning Environments, Cognitive Processes, Nonacademic Settings, and Language. The investigated knowledge was diverse in terms of its types, characteristics, and representations. It came from more than 25 content domains. Frequently referenced theoretical backgrounds were the 3P Model, Cognitive Load Theory, and Conceptual Change approaches. The results indicate that prior knowledge is a widely used cross-sectional research topic. There remains a need for more integrative theories of when and how prior knowledge causally affects learning. More randomized controlled trials with knowledge gains as outcome measures are needed that investigate these questions with complex, realistic learning materials in practical settings.

How Prior Knowledge and Other Individual Variables Interact with Scaffolds in Learning Fractions
Presenting Author: Sarah Hofer, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Frank Reinhold, University of Education Freiburg, Germany; **Co-Author:**Sarah Bichler, Ludwig-Maximilians-University Munich, Germany

Learning depends on how individuals make use of a learning situation. If we want to understand the learning process, we have to consider relevant characteristics of the individual as well as characteristics of the instruction in the context of the content that is to be learnt. Whereas interactions of prior domain knowledge with the degree of guidance during instruction are intensively studied, research on interactions with microlevel instructional scaffolds and, in particular, on interactions between a learning situation and combinations of individual variables beyond prior knowledge is lacking. To learn more about individual learning processes and answer the question who benefits from what type of instructional support, we designed three different scaffolds (visualizations, adaptive tasks, and individualized feedback) to support 335 6^{th}-Grade students from German secondary schools in understanding fractions. Students were randomly assigned to one of the scaffolded conditions or a control group. Prior domain knowledge, engagement, sustained attention, general reasoning, and visual-spatial abilities will be used as profile indicators in a latent profile analysis (LPA) to determine systematically occuring combinations of individual characteristics. We will use multiple-group regression models to examine whether fraction understanding differs as a function of the experimental conditions and the profiles resulting from the LPA. Since data collection has just been completed, we are not yet able to report results.

Preparation for Future Learning in Physics: The Importance of Overlap in Prior Knowledge
Presenting Author: Christian Thurn, ETH Zurich, Switzerland; **Co-Author:**Peter Edelsbrunner, ETH Zurich, Switzerland; **Co-Author:**Ralph Schumacher, ETH Zurich, Switzerland; **Co-Author:**Elsbeth Stern, ETH Zurich, Switzerland

In three sub-studies run within a large-scale longitudinal project, we investigated whether prior knowledge taught in physics instruction in primary school can prepare for future learning of more advanced topics in secondary school. In primary school, students in the intervention group underwent 1-4 inquiry-based teaching units dealing with basic concepts in physics (e.g., floating and sinking) and with experimentation. When these students were in secondary school, they could be compared to classmates who had not undergone these four units in primary school (control group). In secondary school classes, we offered three stand-alone units on magnetism, hydrostatic pressure, and proportionality. These three units differ in knowledge overlap with the four units taught in primary school, which allowed us to investigate what kind of prior knowledge benefits future learning. The unit on magnetism did not overlap in content with the units in primary school but shared the inquiry-based approach requiring experimentation skills. The unit on hydrostatic pressure shared broader conceptual overlap with two of the four units taught in primary school, and the unit on proportionality shared partial conceptual overlap but tested knowledge in the context of mathematics. A comparison of learning outcomes in secondary school revealed an advantage of the intervention group in the units on magnetism and hydrostatic pressure. More detailed analyses within the intervention group indicate that how well students can build on their knowledge gained from the teaching units in primary school depends on the specific overlap with the topics taught later in secondary school.

Session D 5

23 August 2023 08:00 - 09:30
UOM_CH
Symposium
Motivational, Social and Affective Processes

Multiple Perspectives on Student's Emotions Experienced in Class

Keywords: Achievement, Anxiety and Stress, Attitudes and Beliefs, Citizenship Education, Emotion and Affect, Engagement, Mathematics/Numeracy, Quantitative Methods, Secondary Education, Self-regulated Learning and Behaviour, Social Aspects of Learning and Teaching, Social Interaction, Teacher Effectiveness, Teaching/Instructional Strategies
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Lisa Stempfer, University of Vienna, Austria
Chairperson: Elisabeth Graf, University of Vienna, Austria
Organiser: Lisa Stempfer, University of Vienna, Austria
Organiser: Elisabeth Graf, University of Vienna, Austria
Discussant: Reinhard Pekrun, University of Essex, United Kingdom

Students' everyday classroom emotions make a great contribution to shape their overall educational experiences. However, the classroom context as the main academic setting presents researchers with specific challenges. The multitude of influential factors (e.g., inter-individual to intra-individual factors) and the complexity of the (social) situation (e.g., group dynamics) calls for researchers' creativity to realistically depict students' experiences. Therefore, it is the aim of this symposium to deliver a set of studies which investigate students' emotions in class from different angles. These studies not only focus on different contextual antecedents (e.g., teachers, classroom climate) and person-bound factors (e.g., inter- and intraindividual differences) but also include different data types like physiological and questionnaire data, trait and state assessments, cross-sectional and repeated-measures designs. Together, these studies contribute to the knowledge on the relationships between students' emotions and academic performance outcomes, conceptualizing educational success not only as formalized assessments, such as grades, but also real-time problem solving, engagement, and (out-of-school) political participation. Overall, these studies show that while classroom-level factors (study 1, study 3) explain part of the variance in students' emotions, there is a larger amount of unexplored inter- and intra-individual variance in students' emotional lives in class. Students' emotions differ inter-individually within one class (study 2, study 4) and intra-individually, when temporal fluctuations are considered over the course of a lesson (study 4). By providing insights into antecedents of students' emotions, emotion trajectories and regulation strategies, we lay out implications for a more beneficial emotional experience in the classroom setting.

Say it, Feel it: How Emotions in Civic Education Relate to Classroom Climate and Participation
Presenting Author: Elisabeth Graf, University of Vienna, Austria; **Co-Author:**Lisa Stempfer, University of Vienna, Austria; **Co-Author:**Krista Muis, McGill University, Canada; **Co-Author:**Thomas Goetz, Universität Wien, Austria

Given the current political climate, civic education as a tool for strengthening democracies seems more important than ever before. In the context of civic education, the classroom climate during discussions of political and social issues is often considered as an important contextual antecedent of civic learning, as for example civic knowledge, engagement, or participation intention. Although discussions in a classroom with diverse opinions can get very emotional, the role of discrete emotions has rarely been investigated. To address this gap, we examined how the classroom climate during discussions of political and social issues is related to enjoyment, shame, anxiety, and boredom experienced in civic education, and whether these emotions mediate the relationship to political participation. We tested the proposed model based on data from 1,119 students at vocational schools in Austria (grade 10-13). Multilevel structural equation modeling revealed relationships between classroom climate and emotions, but at different levels. While an open classroom climate was positively related to enjoyment at the student level, it was negatively related to anxiety and boredom at the class level. Further, enjoyment mediated the positive relationship at the student level between classroom climate and intended political participation. Taken together, these results imply that fostering a classroom context that is open to diverse opinions can prevent the experience of negative emotions and increase individual students' experience of enjoyment in civic education. There was, however, a broad intra-class variability in students' perception of the classroom climate in civic education and their experienced emotions.

Control, Task-Value, and Emotions Predict Emotion Regulation During Mathematics Problem-Solving
Presenting Author: Kelsey Losenno, McGill University, Canada; **Co-Author:**Krista Muis, McGill University, Canada

Emotion regulation (ER) is an important process that supports students' learning and achievement over time. Choice of ER strategy type is related to differences in learning outcomes. Theorists posit that students' perceptions of control, task-value, and emotional experiences during learning may be important predictors of the ER strategies students use to regulate their emotions, like cognitive reappraisal or expressive suppression. We examined how control, task-value, and emotions relate to students' use of cognitive reappraisal and expressive suppression during a complex mathematics problem-solving activity. Participants included 152 students (72 girls) from grades 3 through 6 from one elementary school. Results demonstrate significant correlations between control and task-value with emotions and both ER strategies, and emotions with ER strategies. Path analysis will be conducted in MPlus to assess the relationships between these variables. Findings may hold important theoretical and educational implications for researchers and educators seeking to support students' ER in classrooms.

Associations between Teacher Heart Rate Variability and Teacher and Student Emotions and Engagement
Presenting Author: Monika Donker, Utrecht University, Netherlands; **Co-Author:**Brianna Kennedy, Utrecht University, Netherlands; **Co-Author:**Sara Scrimin, University of Padova, Italy; **Co-Author:**Tim M. Mainhard, Leiden University, Netherlands

Positive teacher-student relationships benefit both students and teachers. These relationships develop as a result of repeated moment-to-moment interactions composed of emotional exchanges. Students and teachers may experience these emotions both consciously and subconsciously. Subconscious emotional experiences may be indicated by physiological changes. This study analyzed physiological data of 80 Dutch secondary teachers during one lesson in order to assess the potential value of heart rate variability (HRV) for the study of classroom interactions and emotions and the development of student-teacher relationships. In this study, statistical relationships existed between HRV and both teacher and student emotions as well as student engagement. These findings show promise for the role of broader physiological measures, and specifically HRV, in understanding how interactions between teachers and students develop in real time and impact individuals.

Beyond the Mean Score: Inter-Individual Differences in Temporal Fluctuations of Student Boredom
Presenting Author: Lisa Stempfer, University of Vienna, Austria; **Co-Author:**Thomas Goetz, Universität Wien, Austria

Classroom boredom impairs performance. While this has repeatedly been demonstrated from a variable-centered perspective, it is unclear whether it applies equally to all students. An important aspect has hardly been considered so far – the variability of emotional experience over time. This variability cannot be represented with mean scores, but could differentially impact performance. An Experience Sampling design (N = 177 secondary-school students) was used to look behind the mean score and explore this heterogeneity. Time-sensitive indicators were used to quantify students' fluctuation of boredom intensity over the course of a 90-minute lesson. We showed that there is indeed considerable heterogeneity between students' boredom trajectories. Students with higher mean boredom levels tended to fluctuate more frequently and the intensity of their fluctuations was more variable. Correlations with test performance were significant for mean boredom but not for time-sensitive indicators of classroom boredom. Our findings encourage a critical view on the use of mean scores to operationalize classroom boredom, since the existing heterogeneity cannot be adequately displayed. In the next step, person-centered analyses will be used to further explore a potential relationship between trajectory profiles and performance.

Session D 6

23 August 2023 08:00 - 09:30
UOM_A03
Symposium
Cognitive Science

Reading in Digital Contexts: Effects of Distractions and Multitasking

Keywords: At-risk Students, Cognitive Skills and Processes, Comprehension of Text and Graphics, Digital Literacy and Learning, Eye Tracking, Metacognition,

Reading
Interest group: SIG 02 - Comprehension of Text and Graphics
Chairperson: Lucia Mason, University of Padova, Italy
Organiser: Lucia Mason, University of Padova, Italy
Organiser: Ladislao Salmerón, University of Valencia, Spain
Discussant: Ivar Bråten, University of Oslo, Norway

When reading on Internet-connected devices, students are often exposed to the simultaneous presentation of information that is superimposed on the material being read (Baccino & Drai-Zerbib, 2021). Students may also be distracted by advertisements and notifications from social media, or may engage in active multitasking when using two or more media simultaneously, or switching between media (Simola et al., 2011). As our attentional and working memory capacities are limited, disruption during reading may have negative effects on reading processing, comprehension, and meta-comprehension (Hong et al., 2004; Liu & Gu, 2020; Clinton-Lisell, 2021). Against this backdrop, the goal of the symposium is to present a coherent and integrated set of empirical studies that examine various effects of reading in digital contexts. Presentation 1 investigates the role of undergraduates' multitasking reading habits in text comprehension and calibration of performance. Presentation 2 examines the influence of metacognitive scaffolds on reading comprehension and calibration in adults with and without ADHD, considering the role of mind wandering. Presentation 3 studies the effects of on-screen distractions on university students' perception of cognitive load, eye movements during the immediate and delayed text processing, comprehension, and calibration of performance. Presentation 4 investigates university students' reading behavior using eye movements and electrodermal response during and after being interrupted by another reading task, and text comprehension. Finally, a joint discussion will be stimulated by a renowned discussant. The expected outcome of the symposium is a deeper understanding of the impact of digital reading with common disruptions.

Media Multitasking Habits While Reading: Effects on Students' Calibration and Comprehension
Presenting Author: Ladislao Salmerón, University of Valencia, Spain; **Co-Author:**Mario Romero, University of Valencia, Spain; **Co-Author:**Pablo Delgado, University of Sevilla, Spain; **Co-Author:**Lidia Altamura García, University of Valencia, Spain

Much of what we know about the relationship between media multitasking and text comprehension comes from studies that assess the consequences of multitasking during a reading episode. Less is known about the relation between reading media multitasking habits and text comprehension, in reading situations where no multitasking takes place. The goal of this study was to fill in this gap. Forty-three undergraduates read two lengthy expository texts without any distraction either on screen or in paper, predicted their comprehension and answered text comprehension questions. Our results extend previous evidence by showing that, after controlling for relevant individual differences such as topic prior knowledge and reading comprehension skills, students' multitasking reading habits related negatively to text comprehension performance, and positively with overconfidence. Reading media did not affect such relation. We discuss potential mechanisms for such relationships, and suggest the need to reduce multitasking practices during reading.

Metacognitive Scaffolding, Digital Reading, and Mind Wandering in Adults With and Without ADHD
Presenting Author: Adi Brann, Open University of Israel, Israel; **Co-Author:**Yael Sidi, the Open University of Israel, Israel

Digital reading might exacerbate difficulties in sustaining attention and escalate reading comprehension and monitoring differences between learners with and without attention deficit hyperactivity disorder (ADHD). Moreover, learners with ADHD may not sufficiently benefit from general instructions to use strategies that promote in-depth processing (e.g., summary generation). However, one possible affordance of digital environments is the possibility to gradually incorporate learning scaffolds. The current study examined the influence of metacognitive scaffolds on reading comprehension and monitoring of adults with and without ADHD. The mediating role of mind-wandering, a prominent phenomenon associated with sustained attention difficulties, was further examined. Participants (N = 315, 19-50, 43% with ADHD) were randomly assigned to a control or scaffolding condition. In both conditions participants read a lengthy expository digital text, generated a summary, evaluated their mind-wandering, and then answered reading comprehension questions while evaluating their confidence. In scaffolding conditions, further instructions were gradually incorporated to direct attention and encourage self-regulation. In the control condition, the ADHD compared to the non-ADHD group scored significantly less on reading comprehension. Furthermore, only the ADHD group showed negative resolution (relative monitoring accuracy). In the scaffolding condition, there were no reading comprehension or resolution differences between the groups. Furthermore, mind-wandering moderated reading comprehension differences between participants with and without ADHD, but only in the control condition. For learners with ADHD, gradual incorporation of metacognitive scaffolds may enhance the effect of in-depth processing encouragement on monitoring, and minimize the negative effect of mind-wandering on reading comprehension.

Effects of Reading With On-Screen Digital Distractions
Presenting Author: Angelica Ronconi, University of Padova, Italy; **Co-Author:**Lucia Mason, University of Padova, Italy; **Co-Author:**Lucia Manzione, University of Padova, Italy; **Co-Author:**Anne Schueler, Leibniz-Institut für Wissensmedien, Germany

During digital reading on Internet-connected devices, students may be exposed to a variety of on-screen distractions, such as advertisements and social media notifications, as in the current study. It investigated the effects of on-screen distractions during reading on text processing as revealed by eye movements, perception of cognitive load, comprehension, and metacomprehension as calibration of performance. Fifty-five university students participated in a within-subjects design. They read two digital expository texts, one with and the other without distractions, one on Archimedes' principle and the other on seasonal change. Texts shared the same structure with six areas of interest presented on two slides. Participants' eye movements were recorded during reading. Process variables were the first-pass and second-pass fixation times on text areas, and the fixation time on distractions. Cognitive load was measured using a self-report questionnaire. Text comprehension was assessed by multiple-choice questions and metacognitive calibration bias was the difference between judgment of performance and actual performance. Working memory (WM) was taken into account as possible moderator of outcome variables, while controlling for prior knowledge and topic. We performed linear mixed models to consider both fixed and random effects. The main effect of distractions emerged during the immediate text processing as readers' first-pass fixation time was longer with on-screen distractions. Perception of cognitive load, text comprehension, and calibration were not affected by distractions. The interaction distractions x WM was never significant. Very usual on-screen distractions do not seem particularly harmful in university students' learning performance, but have a processing cost.

The Impact of Attentional Disruption During Digital Reading: Tracking the Reading Eyes
Presenting Author:Véronique DRAI-ZERBIB, Université de Bourgogne, France; **Co-Author:**Guillaume Chevet, University of Burgundy, France; **Co-Author:**Marine Michelin, University of Burgundy, France; **Co-Author:**Annie Vinter, University of Burgundy, France; **Co-Author:**Thierry Baccino, University of Paris 8, Italy

A particular dimension of digital reading is the simultaneous presentation of information that is superimposed on the medium being read and the possible interruptions of reading by the arrival of messages likely to disrupt the attention focused on the information being processed. This study investigated how readers are able to retrieve the course of reading once they were interrupted and the interrupted distractor message disappeared. Twenty-six volunteers had to read 4 texts (17 pages) exposing the jobs of archaeologist, croupier, optician, auditor. Half of the participants had the objective of gathering as much information as possible about the job of archaeologist and the other half about the job of croupier. Thus, the targeted information was considered relevant, the rest being irrelevant. The interrupting task consisted in reading a short emotional text. Eye movements and electrodermal response were co-recorded to observe reading behavior during and after interruption. Memory and recall of the text were also evaluated. Results of eye movements showed 1) when reading is interrupted, longer fixation duration in the sentence following the interrupted phrase for relevant information; 2) a larger pupil dilation for positive than negative valence of the distractor, 3) a strategy to resume the reading into the interrupted phrase, or two phrases preceding or following the interruption. Moreover, the comprehension is not disrupted at all, even if verbatim recall is more important for relevant information (compared to irrelevant).

Session D 7

23 August 2023 08:00 - 09:30

AUTH_T102
Symposium
Assessment and Evaluation

Rubrics: old and new research

Keywords: Achievement, Classroom Assessment, Cognitive Skills and Processes, Emotion and Affect, Eye Tracking, Meta-analysis, Qualitative Methods, Quantitative Methods, Self-regulated Learning and Behaviour
Interest group: SIG 01 - Assessment and Evaluation
Chairperson: Ernesto Panadero, Spain
Organiser: Ernesto Panadero, Spain
Discussant: Jeff Greene, United States

Rubrics are quite popular tools worldwide as educational instruments. However, the research built around them has not always been strong (e.g., validity problems, poor research design) and there is repetition about the topics that have been investigated. Additionally, rubrics are rarely implemented by following the best practices from research (e.g., students and teachers are not always trained to effectively make use of rubrics). This symposium will tackle these flaws by reviewing what is known about rubrics effects and presenting new lines of research. The first presentation will meta-analyze the effects of rubrics on academic performance, as to evaluate what the existent research can show us regarding rubrics impact on academic success. The second presentation will discuss the co-creation of rubrics, a line of research that is gaining interest, from a novel approach: a socio-cultural analysis of student, teacher and researcher agency in assessment co-design, drawing on a diverse qualitative dataset. The third and fourth presentation employed the same data collection method –i.e. eye tracking-, with similar purposes. The third presentation used eye tracking to investigate what information students looked at when receiving formative rubric feedback. The fourth presentation explored how students used the rubric at “first sight” and also while receiving four different types of feedback. We believe our symposium represents an interesting balance between summarizing what the “old” research can inform us about rubrics effects -first presentation- and advancing the field via “new” research that offers insights in the use of rubrics -second, third and fourth presentations.

A meta-analysis on the effects of rubrics on academic performance
Presenting Author: Anders Jönsson, Kristianstad University, Sweden; **Co-Author:**Ernesto Panadero, Universidad Deusto, Spain; **Co-Author:**Leire Pinedo, Universidad de Deusto, Spain; **Co-Author:**Belen Fernandez Castilla, Universidad Nacional de Educación a Distancia, Spain

Empirical research on the use of rubrics has grown rapidly during the last decade (Dawson, 2017). From this research, we know that the use of rubrics can have significant and positive effects on students’ learning, academic performance, and self-regulation – provided that the design and implementation of rubrics are adequate. However, in parallel to this research, there is also a strong critique against the use of rubrics for formative purposes (Panadero & Jonsson, 2020). The critique has obvious repercussions for the use of rubrics, since rubrics are probably the most common way of sharing explicit assessment criteria with students. As these concerns are widespread, despite the accumulated empirical support for mainly positive effects, the aim of this study is to perform a meta-analysis on research about the use of rubrics, in order to investigate: (a) whether, and to what extent, the use of rubrics has an impact on students’ academic performance and other important variables related to student learning, and (b) if there are additional factors that may influence the relationship between the use of rubrics and students’ academic performance. The search for relevant research to include was conducted in several databases (e.g., PsycINFO and ERIC), using combinations of keywords. In total, 3,848 records were identified from the databases, but after removing duplicates and publications not meeting all inclusion criteria, 30 studies were left and included in the meta-analysis. Analyses of the data is currently ongoing, and findings will be presented at the conference.

Agency in rubric co-design: a participatory action research approach
Presenting Author: Juuso Henrik Nieminen, The University of Hong Kong, Finland; **Co-Author:**Jani Hannula, University of Helsinki, Finland

We know a great deal from scholarly research about how and why rubrics could promote student learning, yet this knowledge does not always find its way to actual classrooms. This is certainly the case in the exam-driven context of Finnish mathematics education. At the same time, practice-oriented case studies in this field have tended to be undertheorised and potentially repetitive. This study takes a novel perspective of participatory action research to examine how rubric co-design might enhance students’ and teachers’ agency in assessment. We report an in-depth case study of 19 students, their teacher (Jani) andan assessment researcher (Juuso) working together to co-design a rubric and the accompanied assessment practices in Finnish lower secondary mathematics education. The study builds on a socio-cultural analysis of student, teacher and researcher agency in assessment co-design, drawing on a diverse qualitative dataset. Based on the findings, we reframe rubric co-design not only as a way toenhance student learning, cognition and self-regulation, but as a way to promote the values of democratic education. This is important since students and teachersare not always given agency in the debates over assessment practices and policies. We propose participatory action research as a way of closing the research-practice gap when it comes to rubrics, developing this methodology further in the particular context of assessment.

A new view on rubrics – an eye tracking study of formative rubric feedback
Presenting Author: Lieselotte Schmidt Postmes, UMC Utrecht, Netherlands; **Co-Author:**Renske de Kleijn, UMC Utrecht, Netherlands; **Co-Author:**Leen Catrysse, Open Universiteit, Department of Online Learning and Instruction, Belgium; **Co-Author:**Marije Lesterhuis, UMC Utrecht, Netherlands; **Co-Author:**Marieke van der Schaaf, University Medical Center Utrecht / Utrecht University, Netherlands

Rubrics can help generate internal feedback by acting as an external information source. In this study we used eye tracking to gain insight into what information students look at when receiving formative rubric feedback. During a subsequent stimulated recall, the students’ recorded eye movements were discussed to uncover the cognitive processes that are taking place while viewing the rubric. The results show that all students study their supervisor’s feedback and that within student viewing behavior is quite constant. Differences between students lie especially in whether other than the scored quality descriptors are considered. Reasons mentioned by students to study rubric elements are being surprised by the supervisor judgement, having difficulty understanding, and wanting to know how to improve. Their cognitive processes reveal that they also try to understand how supervisors came to their judgement and to value their feedback. Our study underlines the importance of comparisons that students make when studying rubric feedback, as posited in Nicol’s theory of internal feedback generation. This eye-tracking study also reveals that although rubrics provide many sources of information for students to learn, not all information is considered by all students. This highlights the importance of making students and teachers aware of using all the information rubrics have to offer.

How students use rubrics: using process data from eye tracking
Presenting Author: Ernesto Panadero, Universidad Deusto, Spain; **Co-Author:**Pablo Delgado, University of Sevilla, Spain; **Co-Author:**David Zamorano, Universidad de Deusto, Spain; **Co-Author:**Leire Pinedo, Universidad de Deusto, Spain; **Co-Author:**Alazne Fernández Ortube, University of Deusto, Spain; **Co-Author:**Lucía Barrenetxea-Mínguez, University of Deusto, Spain

Rubrics are used around the world with the purpose of providing clear assessment criteria and standards which further influence academic performance. However, our knowledge about how students use rubrics is limited. Additionally, we still need to enlarge our knowledge about how feedback influence the use of rubrics too. Our aim was to explore, using multimodal data, how students use rubrics when performing an activity while receiving four different types of feedback (control vs. process feedback vs. product feedback vs. feedback based on the rubric). In this presentation we will focus in the eye tracking data that we collected. We will explore four research questions and provide preliminary results in the extended abstract, but for EARLI 2023 the data analysis will be completed. Given that presenting the PLs ordered from highest (4) to lowest (1) favored students’ reading efforts on the highest, which, in turn, were the only associated to later task performance, and that this was not the case for the 1-4 order, our results suggest that when presenting rubrics prior to the task, ordering PL from highest to lowest could enhance students’ subsequent performance. On the contrary, if the instructional goal is that the students should pay attention to all levels, it is best to design the rubric with the highest performance level to the right.

Session D 8

23 August 2023 08:00 - 09:30

AUTH_DC2
Symposium

The potential of play for children's learning in uncertain times

Keywords: Cognitive Skills and Processes, Communication Skills, Competencies, Digital Literacy and Learning, Early Childhood Education, Gender Issues, Informal Learning, Mixed-method Research, Qualitative Methods, Social Aspects of Learning and Teaching, Teacher Professional Development, Teaching/Instructional Strategies, Tool Development
Interest group: SIG 05 - Learning and Development in Early Childhood
Chairperson: Lena Hollenstein, University of Teacher Education St.Gallen, Switzerland
Organiser: Lena Hollenstein, University of Teacher Education St.Gallen, Switzerland
Discussant: Franziska Vogt, Switzerland

The present symposium fosters the importance of play in uncertain times. One uncertain aspect is the rapid development in the digitalization context. The way children play has changed over time (Edwards et al., 2013; Frost, 2012; Radesky & Christakis, 2016) together with the affordances, functions, and forms of contemporary toys. Not only toys have changed over time. Our everyday practice and many professions will shift, or many new professions will be invented because of the digitalisation and digital transformation. (Guided) play is a very important way to educating children for those uncertain times. Different forms of play can be distinguished (Wood, 2013). Play in early childhood education can be children's self-chosen and self-led play or more guided forms of play and games designed around specific goals. Practitioners seeking to foster play, for example when joining in as co-players, need to adjust the degree of guidance provided tactfully and intentionally, finding the right balance. This might require pedagogical frameworks rooted in actual practices, and which can help early educators navigate their playful engagements with children (Pyle et al., 2018). In the first paper the importance of children's play for learning is highlighted. In the second contribution the focus is placed on the guidance of the kindergarten educators in general, whereas in the third paper the potential of guided pretend play for exploring digital transformation through play is analysed. In the fourth paper play and technology are focused with an evaluation instrument for technology toys.

The relation of play and learning empirically studied and conceptualised
Presenting Author: Camilla Björklund, University of Gothenburg, Sweden; **Co-Author:**Ingrid Pramling-Samuelsson, University of Gothenburg, Sweden

Play is considered an important aspect of Early Childhood Education and Care. However, the relationship between play and learning is often taken for granted both in research and praxis. In this article, we study our own research group's empirical work over a 40-year period, and how we have used the concepts of play and learning. We observed that how the relation between play and learning has been conceptualised, have gone through changes during this period in a number of ways, in line with other research, influenced by policy, and theorised grounded in empirical studies towards what is called Developmental Pedagogy. Children's perspectives and teacher's sensitivity and responsiveness have been important features of the process of developing the preschool pedagogy in which play and learning are central. The relationship between play and learning are conceptualised differently, at the same time as the content (sometimes called curriculum in the English-speaking world) are equally important in the early as well as latest steps of this development in research.

Early educators navigating a spectrum of play facilitation – exploring how practices weave and shift
Presenting Author: Hanne Jensen, The LEGO Foundation, Denmark; **Co-Author:**Kathrine Jørgensen, The LEGO Foundation, Denmark

Research suggests that young children can learn through play in a range of pedagogical practices: from children's self-chosen and self-led play to more guided forms of play and games designed around specific goals. Importantly, facilitating children's engaged learning through play requires tact and intentionality as adults adjust the degree of guidance provided and even join children as co-players – often, practitioners find this a difficult balance to achieve and this is an issue resonating across countries and cultures, pointing to a need for pedagogical frameworks rooted in actual practices, and which can help early educators navigate their playful engagements with children. This paper explores how early educators in Denmark grew more competent at facilitating children's learning through play. Data derived from a study with professionals enrolled in a professional development module to strengthen their role repertoire in playful situations. The module consisted of 10 theme-based sessions, including on children's perspective and peer communities, design of play and learning environments, child- and adult-initiated play, and pedagogical positioning. As part of the study, focus participants were visited twice in their practice – first while they attended the module, and a second time 4-6 months after module completion. Drawing on field notes and interviews focused on their play-based practices, analyses revealed the rich interplay of participants' reflections on own practice and observed roles with children in playful situations. Findings on early educators' efforts to navigate working realities are discussed with reference to PD support to strengthen play-based practices.

The role of kindergarten educators in pretend play for future skills and digital transformation
Presenting Author: Lena Hollenstein, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Franziska Vogt, St.Gallen University of Teacher Education, Switzerland

Previous research explores how children use digital technology during their pretend play (Arnott et al., 2020; Bird 2020). The role of the kindergarten educators has, however, not been researched widely. It can be assumed, that the guidance provided by early childhood educators plays a significant role in this process, as they join in the pretend play, model and expand the play to ensure creativity and understanding (Vogt, 2020). Guided play is very important for children's learning (Weisberg, Hirsh-Pasek, & Golinkoff, 2013). The review of Skene et al. (2022) shows the effectiveness of guided play for science and math-based learning. Vogt & Hollenstein (2022) show that children can explore processes of digital transformation during pretend play. Still, less is known about how kindergarten educators support the pretend play in such a way that learning about digital transformation is fostered. Specifically, the present paper focuses on the following research questions: (1) Which roles do kindergarten educators take on during guided pretend play? (2) In what way does the guidance of the kindergarten educator enable children to expand their pretend play? First results indicate that teachers have different roles during their guidance. For example, after they leading the situation they can switch in a passive role and children started leading the situation. The discussion will address the different roles of the kindergarten educators' guidance and how these influence the children's participation. The potential of guided pretend play for learning about digital transformation in the area of digital education will be discussed.

Play and technology enhanced toys in early childhood education: an evaluation instrument
Presenting Author: Maria Hatzigianni, University of West Attica, Greece; **Co-Author:**Anastasia Misirli, University of Patras, Greece; **Co-Author:**Vassilis Komis, University of Patras, Greece; **Co-Author:**Maria Dardanou, University of Tromsoe, Norway; **Co-Author:**Iro Voulgari, National and Kapodistrian University of Athens, Department of Early Childhood Education, Greece; **Co-Author:**Dimitra Bourha, University of West Attica, Greece; **Co-Author:**Christoforos Karachristos, University of Patras, Greece

This study aims at trialling a new evaluation instrument of technology-enhanced toys for children birth to eight years old by filling the gap of a scientifically constructed system. The terms used in early childhood literature to describe these toys and the form of play they instigate depend on the theoretical framework adopted. Scholars have coined new terms such as 'converged play' (Edwards, 2020), 'posthuman' or 'postdigital' play (Marsh, 2019) and many others. A new term 'technologically enhanced toys' [TETs] is proposed by this study. In line with the theoretical framework of digital materiality (Leonardi et al., 2019), this study examined toys that attempted to abolish the limits of materiality, facilitate synergies between the real and the virtual space and promote different extents of invention and imagination beyond physical matter. A pragmatic paradigm is adopted, following a mixed methodology (an evaluation instrument, statistics, content analysis). A large number of toys (n = 224) was selected from Amazon based on children's age (birth to eight years) and technical criteria (e.g., sensors, internet connectivity etc). Ethical consideration has been given to ensuring fair representation of toys from a wide range of sources to avoid the possibility of bias. The up-to-date evaluation of toys revealed: limited interactive characteristics, close-ended design, absence of opportunities for creativity and novelty, no criteria for inclusiveness. Findings from this study will significantly assist education stakeholders in their decision-making for trusting, investing, developing and advising on toys towards a play-based pedagogy.

Session D 9

23 August 2023 08:00 - 09:30
AUTH_DC1
Symposium
Assessment and Evaluation, Learning and Social Interaction

Teacher-child interactions in early childcare: Conditions, associations and measurement approaches

Keywords: Classroom Assessment, Early Childhood Education, Quantitative Methods, Social Interaction, Teacher Professional Development, Writing/Literacy
Interest group: SIG 05 - Learning and Development in Early Childhood
Chairperson: Franka Baron, University of Bern, Switzerland
Chairperson: Carolina Guedes, Faculty of Psychology and Educational Sciences, University of Porto, Porto, Portugal, Portugal
Discussant: Yvonne Anders, Otto-Friedrich-University of Bamberg, Germany

Warm, sensitive, and cognitively stimulating interactions are important for children's later skills (e.g., Mashburn et al., 2008). Several structural aspects have been shown to contribute to high-quality teacher-child interactions (e.g., Slot et al., 2015). However, most research is conducted with preschoolers, leaving a knowledge gap about the early onset of such links. Moreover, past research on teacher-child interaction in early childhood education and care (ECEC) has widely used the CLASS observational system, pointing to the need of exploring other accessible and psychometric sound measures. This symposium compiles empirical evidence from multiple perspectives aiming to investigate structural aspects that influence teacher-toddler interactions, examine the importance of the early onset of process quality for children's later development, and explore multiple ways to measure teacher-child quality of interactions in ECEC. Paper 1 focuses on domains of interaction quality and their associations with teachers' age, education, children's age composition, and group size in German toddler classrooms. Paper 2 investigates the associations between teachers' job satisfaction and in-service professional development, and teacher-toddler interaction quality in Portugal. Paper 3 examines how interaction quality in Finnish toddler classrooms influences children's emergent literacy skills in preschool. Paper 4 explores different measurements of interaction quality in preschool. The discussion will outline structural aspects that influence teacher-child interaction quality and highlight the importance of high process quality from an early, with important implications for pre- and in-service professional development programs. Furthermore, the discussion will give important insights into measurement approaches across ECEC, contributing to current knowledge in the field.

Domains of teacher-toddler interactions and associations with conditions in early childcare settings
Presenting Author: Franka Baron, University of Bern, Switzerland; **Co-Author:**Anja Linberg, German Youth Institute, Germany; **Co-Author:**Simone Lehrl, PH Weingarten, Germany; **Co-Author:**Dorothea Dornheim, University of Bamberg, Germany

This study examines domains of teacher-toddler interactions in early childcare settings and investigates their associations with structural characteristics. Ninety-five toddler classrooms located in Bavaria, Germany were observed and rated with CLASS Toddler (La Paro et al., 2012) and data on teachers and conditions within the childcare settings were assessed through self-report questionnaires. Confirmatory factor analyses and structural equation modeling were conducted using R. The results were in favor of a two-, instead of a one- or three-factor structure, which included the 'emotional and behavioral support' (EBS) and the 'engaged support for learning' (ESL) domains. The model showed a feasible fit: $\chi^2(19)=56.51$, p

Associations between job satisfaction, professional development, and educator-child interactions
Presenting Author: Carolina Guedes, Faculty of Psychology and Educational Sciences, University of Porto, Porto, Portugal, Portugal; **Co-Author:**Joana Cadima, University of Porto, Portugal

Educator-child interactions are vital for children's development (Bronfenbrenner & Morris, 2006). Previous studies have suggested that educators' well-being and participation in professional development activities were associated with educator-child interaction quality in preschool (Egert et al., 2020; Penttinen et al., 2020). However, little is known about how educators' job satisfaction and participation in professional development activities are linked to educator-child interactions in toddler classrooms (Cassidy et al., 2017). The current longitudinal study aims to test the associations between educators' reported job satisfaction and frequency of in-service professional development activities, and educator-child interaction quality in toddler classrooms. Participants were 70 Portuguese leading educators and assistants working in 30 toddler classrooms. Educators and assistants reported on their job satisfaction and in-service professional development activities (Slot et al., 2015) with two questionnaires in the fall. Educator-child interactions were observed with the CLASS-Toddler (La Paro et al., 2012) in the winter. Results showed associations between job satisfaction and negative climate, educator sensitivity, behavior guidance and facilitation of learning and development. Staff with more frequent in-service professional development activities achieved higher ratings in engaged support for learning related dimensions of the CLASS-Toddler measure. These findings shed light on the importance of job satisfaction for warm, sensitive, and cognitive-stimulating interactions, and on the importance of providing educators and assistants with professional development activities to enhance their ability to engage toddlers in interactions that further support and challenge their learning and development.

Longitudinal association between teacher-child interaction quality and children's literacy skills
Presenting Author: Jenni Salminen, University of Jyväskylä, Finland; **Co-Author:**Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

Teacher-child interaction quality has been shown to predict gains in the development of children's literacy skills in ECEC and in school, but only limited evidence exists for the early onset longitudinal associations. The aim of the present study was to investigate the association between the quality of early teacher-child interactions in toddler classrooms (age 2–3) and children's emerging academic skills later at the age of 5–6. Children's (n = 206) emerging literacy skills were assessed twice at the age of 2.5–3 and again at the age of 5.5–6. The quality of teacher-child interaction was evaluated in toddler classrooms (n = 41) using the CLASS-Toddler observation instrument. The analyses were conducted with longitudinal path models with the Complex option. The results indicated that after controlling for parental level of education, child gender and age and the previous level of investigated variables, the higher quality of engaged support for learning was related to higher phonological awareness at the age of 5.5 and on broader receptive vocabulary the age of 6. The results therefore imply that the quality of teacher-child interaction in ECEC toddler classrooms has longitudinal benefits in terms of supporting children's emerging literacy skills at the entry to pre-primary education. The results call for a need to address the characteristics of teacher support in detail within pre- and in-service training and especially put more effort on supporting the quality of cognitively stimulating learning interactions already in toddler classrooms.

Measuring Interaction Quality in ECEC: An Empirical Analyses of the CLASS Pre-K and the SSTEW
Presenting Author: Elisa Oppermann, University of Bamberg, Germany; **Co-Author:**Lars Burghardt, University of Bamberg, Germany; **Co-Author:**Julia Barenthien, University of Hamburg, Germany; **Co-Author:**Mirjam Steffensky, University of Hamburg, Germany; **Co-Author:**Yvonne Anders, Otto-Friedrich-University of Bamberg, Germany

The empirical research literature has demonstrated the immense potential of high-quality interactions in preschool settings for children's learning and development. Attention has thus grown around methodological approaches to measuring interaction quality in preschool. The present study compares the well-established CLASS Pre-K (Classroom Assessment Scoring System; Pianta et al., 2008) and the more recently developed SSTEW (Sustained Shared Thinking and Emotional Wellbeing Scale; Siraj-Blatchford et al., 2015). Conceptually, the two measures cover similar dimensions of interaction quality with a slightly different focus particularly in the operationalization of cognitively stimulating interactions. Empirically, findings show good psychometric properties of both scales. The similar pattern of quality ratings found across measures and the positive correlations between conceptually related dimensions indicate convergent validity of the scales. Implications for research are discussed.

Session D 10

23 August 2023 08:00 - 09:30
AUTH_T002
Single Paper

Assessment and Evaluation, Higher Education, Teaching and Teacher Education

Teachers' Assessment Methods

Keywords: Assessment Methods, Attitudes and Beliefs, Competencies, Curriculum Development, Early Childhood Education, Feedback, Higher Education, Pre-service Teachers, Science and STEM, Simulation-based Learning, Teacher Professional Development
Interest group: SIG 01 - Assessment and Evaluation, SIG 05 - Learning and Development in Early Childhood, SIG 11 - Teaching and Teacher Education
Chairperson: Estelle Desjarlais, Université du Québec à Montréal, Canada

Design choices in programmatic assessment: balancing between formative and summative
Keywords: Assessment Methods, Curriculum Development, Feedback, Higher Education
Presenting Author: Bas Agricola, HU University of Applied Sciences, Netherlands; **Co-Author:**Marlies de Vos, Open University the Netherlands, Netherlands; **Co-Author:**Tamara van Schilt-Mol, HAN, Netherlands; **Co-Author:**Liesbeth Baartman, University of Applied Sciences Utrecht, Netherlands

Assessment in higher education (HE) is often focused on concluding modules with one or more tests that students need to pass. As a result, both students and teachers are primarily concerned with the summative function of assessment: information from tests is used to make pass/fail decisions about students. In recent years, increasing attention has been paid to the formative function of assessment and focus has shifted towards how assessment can stimulate learning. However, this also leads to a search for balance between both functions of assessment. Programmatic assessment (PA) is an assessment concept in which their intertwining is embraced to strike a new balance. A growing number of higher education programmes has implemented PA. Although there is consensus about the theoretical principles that form the basis for the design of PA, programmes make various specific design choices based on these principles, fitting with their own context. This paper provides insight into the design choices that programmes make when implementing PA and into the considerations that play a role in making these design choices. Such an overview is important for research purposes because it creates a framework for investigating the effects of different design choices within PA.

Acceptance of simulation-based assessment formats in teacher education
Keywords: Assessment Methods, Competencies, Simulation-based Learning, Teacher Professional Development
Presenting Author: Christoph Vogelsang, Paderborn University, Germany; **Co-Author:**Jana Meier, University of Paderborn, Germany, Germany; **Co-Author:**Thomas Janzen, PLAZ Professional School - Paderborn University, Germany; **Co-Author:**Philipp Wotschel, Paderborn Centre for Educational Research and Teacher Education - PLAZ-Professional School - University of Paderborn, Germany

Following a comprehensive understanding of competence (Blömeke et al., 2015), which includes the dispositional level as well as situation-specific skills and observable action (performance), learning environments and assessment formats are needed in academic teacher education that enable the development and assessment of competencies related to practice. Simulation-based settings and formats, such as role-plays, are one possible method of simulating typical requirements of the profession under conditions that are as authentic as possible and allow “approximations of practice [that] include opportunities to rehearse and enact discrete components of complex practice in settings of reduced complexity” (Grossman et al., 2009a, S. 238). Such settings are also implemented more widely in other profession-related programs such as medicine (St. Pierre & Breuer, 2013). For teaching and practice purposes, such methods have also been developed for teacher training, but performance-based examination formats receive little attention in this regard, even though they are just as important for a holistic competence-oriented design of learning processes (Schaper, 2012). This article reports on the experiences and perceptions of (N=620) master's student teachers regarding role-play-based exercise and examination formats, which were collected in the course of an online survey. In addition, results are reported from interviews (N=16) that were conducted with student teachers who participated in role-play-based simulations. Student teachers perceive the relevance and authenticity of such examination formats especially high, but are sceptical about the evaluation and grading of such formats – unless they have participated in a simulation.

Assessing pre-service EFL teachers’ feedback performance in role-play-based simulations
Keywords: Assessment Methods, Higher Education, Pre-service Teachers, Simulation-based Learning
Presenting Author: Thomas Janzen, PLAZ Professional School - Paderborn University, Germany; **Co-Author:**Philipp Wotschel, Paderborn Centre for Educational Research and Teacher Education - PLAZ-Professional School - University of Paderborn, Germany; **Co-Author:**Jana Meier, University of Paderborn, Germany, Germany; **Co-Author:**Christoph Vogelsang, Paderborn University, Germany

Simulations involving role-plays with standardized patients have long been a corner stone of medical education, allowing aspiring medical personal to show their competence in an action-oriented way (Miller, 1990). In teacher education, such simulations could be a way to address the often-proclaimed gap between theory and practice, as these would allow pre-service EFL teachers to be assessed based on their performance rather than their declarative and procedural knowledge. Focussing on approximating one core practice of EFL teachers, such a simulation was developed to test pre-service EFL teachers’ feedback competence on written learner products (Grossman et al., 2009). This paper presents results from a pilot study (N=10) in which general feasibility and student acceptance were evaluated. Using student and expert interviews, as well as potential covariates such as feedback knowledge and general competence in the field of English didactics, the validity of the test will be explored. Preliminary results from the pilot study indicate that students generally have a positive attitude towards this new form of assessment as it allows them to demonstrate their abilities in a more action-oriented manner in an authentic, school-like situation. Based on these preliminary findings, a main study will be conducted for further validation.

Are Preschool Teachers Willing to Engage in Learning Situations?
Keywords: Assessment Methods, Attitudes and Beliefs, Early Childhood Education, Science and STEM
Presenting Author: Lukas Schmitt, RPTU Kaiserslautern-Landau, Germany; **Co-Author:**Miriam Leuchter, RPTU Landau, Germany; **Co-Author:**Laura Venitz, University of Koblenz-Landau, Germany

Abstract
The importance of diagnostic and scaffolding activities for early science learning in preschool has been shown in previous studies consistently. However, the use of diagnostic and scaffolding techniques in everyday situations as well as in mathematics and science learning opportunities is scarce. Hitherto, there is no diagnostical instrument besides behavioral observations to assess preschool teachers’ willingness to engage in diagnostic and scaffolding activities in learning situations. Thus, the aim of the current study is the validation of a self-developed situation-based instrument. Participants were presented with 5 vignettes displaying learning situations in preschool and were asked to rate six items for each vignette on a four-point-Likert-scale. For our model, we proposed three underlying factors (Diagnosis, Scaffolding and Inactivity). The sample consisted of N=151 preschool teachers from kindergartens in South West Germany. The assumed 3-dimensional model yielded an acceptable fit. Multiple regression analyses showed that co-constructivist learning beliefs were positively associated with the willingness to engage in diagnostic and scaffolding activities, respectively. Besides, the more teachers valued experience, the more they were willing to engage in diagnostic activities. Preschool teachers’ age was positively correlated with the willingness to engage in scaffolding activities; however, it was not associated with the willingness to engage in diagnostic activities and inactivity. Results suggest that individual prerequisites of preschool teachers seem to predict the willingness to engage in diagnostic and scaffolding activities and therefore should be taken into account in future research.
Keywords: Assessment methods, Attitudes and Beliefs, Early Childhood Education, Quantitative methods, Science and STEM, Teacher Effectiveness.

Session D 11

23 August 2023 08:00 - 09:30
UOM_A02
Single Paper
Assessment and Evaluation, Higher Education, Teaching and Teacher Education

Mentoring and Supervision in Workplace Learning

Keywords: Assessment Methods, Emotion and Affect, Health-care Education, Higher Education, In-service Teachers, Mentoring and Coaching, Mixed-method Research, Qualitative Methods, Self-regulated Learning and Behaviour, Social Interaction, Teacher Professional Development, Teaching/Instructional Strategies, Vocational Education and Apprenticeship Training
Interest group: SIG 14 - Learning and Professional Development
Chairperson: Nele Bleukx, KU LEUVEN, Belgium

What do workplace educators value about student performance?
Keywords: Assessment Methods, Higher Education, Qualitative Methods, Vocational Education and Apprenticeship Training
Presenting Author: Marlies de Vos, Open University the Netherlands, Netherlands; **Co-Author:**Liesbeth Baartman, University of Applied Sciences Utrecht, Netherlands; **Co-Author:**Cees van der Vleuten, Maastricht University, Netherlands; **Co-Author:**Elly de Bruijn, Hogeschool Utrecht / OU, Netherlands

Workplacement is a part of vocational education that helps prepare students for their future at work. Its assessment is complex since school often determines what is assessed, but this does not reflect what the workplace considers important about student performance. This paper approaches school and work as two activity systems with different people, rules and tools and with different assessment practices. Using the philosophy of inferentialism as a novel perspective, this paper aims to explore what workplace educators value about student performance. We analysed our interview data using a grounded theory approach. The findings show that workplace educators value different aspects of student performance that can be described along three frames: 1. a vocational frame focused on what it means to be a successful practitioner in a specific community of practice, 2. an educational frame focused on learning attitudes, visibility of learning and autonomy, 3. an expectation frame based on the workplace educator's expectations of the student related to their start at the workplace (e.g. prior experience and first impressions). Through the application of inferentialism this paper offers a new perspective on assessment that could be the starting point of reevaluating the assessment of workplace performance in vocational education and finding ways to establish a closer collaboration between the activity systems school and work.

Is it the clinical supervisor's role to support medical students' emotional challenges – if so when?
Keywords: Emotion and Affect, Higher Education, In-service Teachers, Qualitative Methods
Presenting Author: Linda Barman, KTH, Royal Institute of Technology, Sweden; **Co-Author:**Maria Weurlander, Stockholm University, Sweden; **Co-Author:**Henrik Lindqvist, Linköping University, Sweden; **Co-Author:**Robert Thornberg, Linköping University, Sweden; **Co-Author:**Annika Wernerson, Karolinska Institutet, Sweden

In this study, we report on clinical supervisors' views of their role and responsibilities to support medical students' emotional challenges during work-based education. Medical students spend significant time of their studies in healthcare with the purpose of learning and developing professional skills and approaches necessary as a practicing physician. Previous research show that students experience emotional challenges during work-based education that may affect their professional becoming, but that they seldom feel supported by clinical supervisors to cope with or process these situations. Based on interviews with 20 physicians with different medical specialties working in the Swedish healthcare, and missioned to supervise undergraduate students, we conducted a constructivist grounded theory analysis. The findings suggest that supervisors' awareness of students' challenges, their attitudes towards their profession and attribution of causes for students' emotional challenges influenced how they viewed their role and responsibilities to support students' emotional challenges during work-based training. Supervisors who did not perceive that their role entailed to support students' emotional distress, had no supporting strategies, whilst others used the education design to protect students from being exposed to emotional challenging situations. Supervisors who emphasised the importance for students to process emotional experiences from clinical work, reported limited opportunities to provide situation-near support but reflective seminars outside clinical practice may offer some reflection-on-action.

Pedagogic strategies of supervisors in health care placements
Keywords: Health-care Education, Mentoring and Coaching, Social Interaction, Teaching/Instructional Strategies
Presenting Author: Lieke Ceelen, Open University of the Netherlands, Netherlands; **Co-Author:**Anne Khaled, HAN University of Applied Sciences, Netherlands; **Co-Author:**Loek Nieuwenhuis, Open University of the Netherlands, Netherlands; **Co-Author:**Elly de Bruijn, Open University of the Netherlands, Netherlands

Supervising students at work is a valuable practice to contribute to the training of future colleagues in the profession. The focus of this study is to explore pedagogic strategies used by supervisors in the context of healthcare students' workplace learning. Pedagogic strategies include the interplay between reasons and actions (De Bruijn, 2012). In our previously published literature study we found supervisors to (1) demonstrate vocational activities, (2) entrust vocational activities, and (3) stimulate students' participation in the vocational community. We used these three perspectives on workplace pedagogy to empirically investigate the supervisors' pedagogic strategies in the contexts of seven healthcare placements. In these work settings, we observed the daily activities and interactions between supervisors and students. After the observation days, the supervisors were interviewed to find out their reasoning in relation to their actions. Findings reveal supervisors' pedagogic strategies, including their supportive actions and interventions and their pedagogic reasoning in the situated settings of three student-physiotherapists' and four student-nurses' placements. The study illustrates how supervisors are continuously challenged to balance the interests of the patient, the student, the supervisor's own interests and the interests of the school or organization. Our insights into pedagogic strategies provide opportunities to discuss and to promote the various manifestations of student support at the workplace.

Uncovering hidden Professional Learning Needs and Learning Preferences of Mentors in Flanders
Keywords: Mentoring and Coaching, Mixed-method Research, Self-regulated Learning and Behaviour, Teacher Professional Development
Presenting Author: Panayota Cotzaridis, KU LEUVEN, Belgium; **Co-Author:**Eline Vanassche, KU Leuven, Belgium; **Co-Author:**Ruben Vanderlinde, Ghent University, Belgium

Mentoring has become an integral part of teacher education, as it enhances teachers' reflective practice as well as school professional development (Trevethan & Sandretto, 2017). However, researchers have thus far focused more on the role of teacher educators based in higher education (i.e. *university-based teacher educators*) and less on mentors in schools (i.e.*school-based teacher educators*) (e.g. Lunenberg et al., 2014). While both groups of teacher educators contribute significantly to teacher education, their professional development requires different approaches (Cochran-Smith, 2003) as they need specific answers to their learning needs (Kelchtermans et al., 2018). Taking a 'practice-based' viewpoint (Kelchtermans, 2013), I investigate the professional developmental needs that school-based teacher educators in Flanders (Belgium) encounter. It is therefore important to consider the national context when examining teacher education. A brief analysis of Flanders' teacher education policy illuminates further the significant role of mentors in the context of Flanders - currently faced with a growing teacher shortage. The study will therefore serve as a valuable resource for practitioners and policy makers in terms of knowing what mentors needs, sharing important information for trainers of mentors and supporting further research. The research analysis adopts a mixed-methods approach, reporting on survey (N = 67) and follow-up interview data (N = 13). This study is part of a large-scale international research of school-based teacher educators in Europe, making it a unique contribution to Flanders.

Session D 12

23 August 2023 08:00 - 09:30
AUTH_TE2
Single Paper
Higher Education, Motivational, Social and Affective Processes, Teaching and Teacher Education

Emotion Regulation and Well-being

Keywords: Burnout, Emotion and Affect, Higher Education, Motivation, Primary Education, Science and STEM, Secondary Education, Self-regulated Learning and Behaviour, Social Aspects of Learning and Teaching, Teacher Professional Development, Teaching Approaches, Tool Development, Well-being

Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion
Chairperson: Alejandro Ortega-Arranz, Spain

The decline of learning enjoyment and learning effort over primary and lower-secondary school
Keywords: Emotion and Affect, Motivation, Primary Education, Secondary Education
Presenting Author: Anna Hawrot, Leibniz Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:**Ilka Wolter, Leibniz Institute for Educational Trajectories (LIfBi), Germany

This study inquired into trajectories of learning enjoyment and learning effort over primary and lower-secondary school. It also verified if gender, migration background, and SES predicted their initial level and change. We used two independent large-scale panel samples with longitudinal data on (1) parent-reported student enjoyment and effort in Grades 1 to 3 (three measurement occasions) and (2) student-reported enjoyment and effort in Grades 3 to 10 (seven measurement occasions), over 9,500 observations in total. The data came from the German National Educational Panel Study. Parallel process curve-of-factor growth curve models estimated for each sample separately revealed a decline in learning enjoyment and learning effort over time. The size of the decline in the two characteristics was similar: 0.23-0.29 of *SD* between Grades 1 and 3; 0.39-0.43 of*SD* between Grades 3 and 10. Learning effort decreased gradually in both samples. Learning enjoyment decreased gradually in the first sample but showed a temporary increase just after the transition to lower-secondary school (between Grades 4 and 5) in the second sample. The results on group differences in the initial level and decline were mixed. We found some differences in the initial level of enjoyment and effort in favour of female students, students with a migration background, and students with high SES. The role of gender, migration background, and SES for the decline varied. The study provides further support for a decrease in school-related emotional and motivational functioning over primary and lower-secondary school.

Help me if you can I'm feeling down: Supporting emotion regulation and well-being in the classroom
Keywords: Emotion and Affect, Self-regulated Learning and Behaviour, Social Aspects of Learning and Teaching, Well-being
Presenting Author: Matt Somerville, IOE, UCL's Faculty of Education and Society, United Kingdom; **Co-Author:**Emily Midouhas, IOE, UCL's Faculty of Education and Society, United Kingdom; **Co-Author:**Marcos Delprato, University of Sussex, United Kingdom

Children living in socioeconomically disadvantaged communities face a wide range of stressors that are different from those experienced by children from more advantaged homes. Research indicates that higher levels of well-being in children may act as a buffer against the negative effects of stress and adversities, and that supportive teacher behaviours may play a key role in promoting pupil's socio-emotional development and well-being. This paper presents the results of a naturalistic study of the associations between pupil perceptions of teacher support, emotion regulation and well-being in the primary classroom. The study was carried out in 31 classrooms across 8 primary schools situated in low socioeconomic neighbourhoods of New Zealand. In Phase 1, 508 pupils (M_{age} 9.9 years) completed questionnaires on wellbeing, emotion regulation and supportive teacher behaviours. Four classrooms were selected for Phase 2, which involved classroom observations of teacher support. We applied multilevel modelling to account for the hierarchical nature of the data and found that teacher support was a significant predictor of both emotion regulation and well-being, and that emotion regulation mediated the teacher support–wellbeing link. We also found a significant interaction between teacher support and school socio-economic status, indicating that teacher support was especially beneficial for pupils attending schools in the less disadvantaged communities of the sample. The observational data revealed that the classrooms rated as most supportive were characterised by autonomy-supportive teacher behaviours, clear expectations, and warm, low-conflict teacher-child relationships. The implications of these findings for practice, policy, and future research will be discussed.

Science students' burnout profiles, social identity and trust for teachers' faith in their abilities
Keywords: Burnout, Higher Education, Science and STEM, Well-being
Presenting Author: Liisa Myyry, University of Helsinki, Finland; **Co-Author:**Veera Kallunki, University of Helsinki, Finland

The well-being of students is a current topic in higher education, and it is related to how well students feel they fit in with their study community. Feeling the sense of belonging to other human beings is essential, as we are social animals. Students' sense of belonging to their study community in higher education is associated with students' engagement and happiness, and positive social identity improves well-being and protects against loneliness, but the social engagement requires the feelings of trust. We examined how study-related burnout, sense of belonging, social identity and trust for teachers are related, and measured them from 200 science students. We ran an LPA analysis and identified three burnout profiles: not exhausted, moderately exhausted and highly exhausted. The trust that teachers have faith in students' abilities and identification with degree programme students varied significantly according to the burnout profile, highly exhausted students showing lower levels of trust and social identity than not exhausted. The results indicate that both the importance of social identity and trust in teachers for higher education students should be scrutinized in further studies.

Utilisation of self-reflection-based feedback to support teaching and well-being in higher education
Keywords: Teacher Professional Development, Teaching Approaches, Tool Development, Well-being
Presenting Author: Telle Hailikari, Häme University of Applied Sciences, Finland; **Co-Author:**Siru Myllykoski-Laine, University of Turku, Finland; **Co-Author:**Anna Parpala, University of Helsinki, Finland; **Co-Author:**Liisa Postareff, HAMK University of Applied Sciences, Finland

Reflection has long-term effect on the teacher's learning-oriented teaching (e.g. Noben et al., 2021), which emphasizes interactive processes and pedagogical awareness (Postareff & Lindblom-Ylänne, 2008; Cao et al., 2018). Although reflection has been found to support teachers' well-being (Wosnitza et al., 2018), there are still few research-based tools to support higher education teaching and well-being. This study examines higher education teachers' experiences of a research-based self-reflection tool regarding teaching and well-being. A previously developed HowUTeach self-reflection tool was used (Parpala & Postareff, 2021) including statements measuring teaching processes and well-being, as well as written feedback developed for each scale. The participants (n=17) answered the HowUTeach survey, based on which they received written feedback on the different dimensions. The feedback described what the different dimensions of the survey measure and gave tips for developing teaching and well-being. After the survey, the participants took part in group interviews (a total of 6 including 2-3 teachers/interview). The interviews were analyzed using thematic analysis.The experiences evoked by using the self-reflection tool could be divided into three different themes: 1) reflection provides support for reflection on one's own teaching and well-being 2) reflection makes one think about the importance of the teaching context in teaching 3) joint discussion is needed to support self-reflection. The results show that self-reflection regarding teaching and well-being is especially useful if the teacher has already used reflection as part of their teaching, and if the teacher has the opportunity to discuss reflection with other teachers.

Session D 13

23 August 2023 08:00 - 09:30
UOM_R08
Single Paper
Higher Education, Learning and Social Interaction

Teacher-Student Interactions and Social Aspects of Learning

Keywords: Communities of Learners and/or Practice, Computer-assisted Learning, Early Childhood Education, Higher Education, Peer Interaction, Primary Education, Qualitative Methods, Social Aspects of Learning and Teaching, Social Interaction, Teacher Effectiveness, Tool Development, Video-based Learning, Well-being
Interest group: SIG 04 - Higher Education, SIG 05 - Learning and Development in Early Childhood
Chairperson: Maria T. Sikkema-de Jong, Leiden University, Netherlands

Development of an observation system for teacher-child interaction in lower primary school classes

Keywords: Primary Education, Social Aspects of Learning and Teaching, Teacher Effectiveness, Tool Development
Presenting Author:K.M. Starreveld, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Mathilde Overbeek, VU University Amsterdam, Netherlands; **Co-Author:**Agnes Willemen, VU University Amsterdam, Netherlands; **Co-Author:**Marian Bakermans-Kranenburg, ISPA - University Institute, Portugal

The importance of positive teacher-child interactions for children's development is well established. The Arnett Caregiver Interaction Scale (CIS; 1989) is a widely used measure of quality in caregiver-child interactions, yet it has serious psychometric and theoretical limitations. An adaptation of this scale, The Child Caregiver Interaction Scale (CCIS) (Carl, 2010), is a more valid and reliable measure for assessing group-interactions of caregivers and children in child care. Adapting it for use in primary schools may offer opportunities for measurement and teacher coaching. Here we describe the adaptation process of the Child Caregiver Interaction Scale for Primary schools (CCIS-P), present an overview of the preliminary findings regarding its psychometric properties look at associations with children's perceived quality of interaction with their teacher. As part of a larger study on teacher coaching, thirty-eight early primary school teachers were observed in their classrooms using the CCIS-P and one of their students completed a questionnaire regarding their appraisal of teacher support (Y-CATS; Mantzicopoulos & Neuharth-Pritchett, 2003). Results show that the CCIS-P demonstrates high internal consistency on the total scale (Cronbach's Alpha .82) and high inter-rater reliability on the domains (mean ICC .87 to .88) Preliminary results show positive correlations between child experienced autonomy in the relationship with the teacher and the Total CCIS-P score (r = .33; p = .05) and the Emotional domain (r = .39; p = .02). This study contributes to the understanding on how observation systems can be used to measure and improve teaching.

Impacts of Tablet Computer Use on the Quality of Teacher-Child Interactions
Keywords: Computer-assisted Learning, Early Childhood Education, Social Interaction, Video-based Learning
Presenting Author: Ueli Thomas Studhalter, University of Teacher Education Lucerne (PH Luzern), Switzerland; **Co-Author:**Jossen Priska, University of Teacher Education Lucerne (PH Luzern), Switzerland; **Co-Author:**Marco Seeli, University of Teacher Education of Lucerne, Switzerland; **Co-Author:**Annette Tettenborn, University of Teacher Education of Lucerne, Switzerland

The aim of the study was to examine the role of tablet computers in a specific learning scenario in preschool classes. The scenarios consisted in the teachers' accompaniment and support of children's block play. The teachers could use a tablet computer to support children's learning through visual feedback using short videos. For the children, the learning objective was to expand their knowledge about the stability of their block constructions. As part of an extensive field study, two teachers were videotaped while assisting children's play and learning. We performed a video analysis using MAXQDA software based on 8.7 hours of video footage. Herby, 486 teacher-child interactions were quantified to assess their quality. We wanted to examine how the quality of teacher-child interactions relates to conditions of use vs. non-use of tablet computer. Referring to the concept *sustained-shared thinking*, we define valuable interactions as those episodes that involve a deep, prolonged intellectual and content-specific exchange between the teacher and one or more children. To assess the quality of teacher-child interactions in such a way, we evaluate: (a) duration, (b) children's participation, and (c) teachers' scaffolding activities. Preliminary results suggest that the tablet-supported teacher-child interactions are of longer duration, while child participation differs partially compared to non-tablet interactions. The results are critically discussed considering technology-enhanced teaching and learning in early childhood education.

Decoding Prosociality: Understanding Classroom Based Experiences
Keywords: Peer Interaction, Qualitative Methods, Social Interaction, Well-being
Presenting Author: Aneeza Pervez, IOE, UCL's Faculty of Education and Society, United Kingdom; **Co-Author:**Matt Somerville, IOE, UCL's Faculty of Education and Society, United Kingdom; **Co-Author:**Ed Baines, IOE, UCL's Faculty of Education and Society, United Kingdom

Objective: Although there is much research on prosociality, very little aims to understand children's perspectives on prosociality and the influence of school context. This study sought to explore ways in which children and teachers conceptualize prosociality in classroom settings. Design: semi-structured interviews and activity-based paired interviews were used to collect data. Paired interviews were used with children to counter response bias and power inequality inherent in semi-structured interviews. Moreover, a participatory design was used to promote reflexivity in children and combat a loss of interest. Methods: The sample of the study comprised 15 primary school teachers (2 male 13 female) and 15 Year 5 students (9 boys and 6 girls; age range 9 - 10 years; m = 9.28 years). Interviews with the children were divided into two parts; in the first half children were asked questions about their experiences. The second half was structured around a storytelling activity supported by visual cues. Interview transcripts were analysed using reflexive thematic analysis. Results: The analysis yielded three main themes; Conceptualization of prosociality (the essence of helping and kindness), Prosocial encounters in the classroom (helping, sharing and comforting in action) and Personal, social and relational structures influencing prosocial responding in classrooms (the role of teachers in promoting prosociality). Conclusion: This study highlights teachers' and children's understanding of prosociality in a structured environment and the impact classroom settings have on prosocial displays in children. The classroom ethos, as well as teacher's classroom strategies, are imperative in promoting positive interactions and prosociality in children.

Exploring student-staff's contribution to quality work in higher education
Keywords: Communities of Learners and/or Practice, Higher Education, Qualitative Methods, Social Aspects of Learning and Teaching
Presenting Author: Hannah Mülder, Faculty of Education, University of Oslo, NO, Norway; **Co-Author:**Carolina Borges Rau Steuernagel, Faculty of Medicine, University of Oslo, Norway; **Co-Author:**Rachelle Esterhazy, University of Oslo, Norway; **Co-Author:**Tone Dyrdal Solbrekke, Faculty of Education, University of Oslo, Norway

Recent initiatives for student-centred, collaborative, and interactive learning in higher education rely on the increased participation of student-staff (i.e. students employed by the university) to facilitate and support student learning. Implementing and further developing these initiatives requires continuous quality work and adaption. The concept of quality work comprises students' and staffs' activities and practices as they intend to improve, impact and define the quality of the education they are involved in. While interactions between and experiences by student-staff and participating students are explored in research, less is known about student-staffs' work surrounding teaching-learning situations. Quality work processes emerge from a combination of institutional structures, local practices and individual agency and influence teaching and learning in visible and invisible ways. We aim to characterise situations in which student-staff engage in quality work in the context of peer-mentors facilitating team-training activities for first-year medical students, aiming to develop collaborative skills. Using an ethnographic approach, we followed peer-mentors in preparatory courses, team building seminars and meetings with faculty, with participant observation and semi-structured interviews over a period of one year, combined with document analysis of educational material. Preliminary findings show that situations in which peer-mentors engage in quality work differ in purpose and structure being pre-set or emergent, who is participating, who in charge and what peer-mentors do. We thus aim to take a step towards developing the concept of quality work and gaining better empirical understanding of student-staffs' work and how to support it.

Session D 14

23 August 2023 08:00 - 09:30
AUTH_T202
Single Paper
Learning and Instructional Technology

Game-based Learning

Keywords: Citizenship Education, Computer-assisted Learning, Creativity/Divergent Thinking, Critical Thinking, E-learning/ Online Learning, Educational Technologies, Environmental Education, Game-based Learning, In-service Teachers, Knowledge Construction, Motivation, Problem Solving, Problem-based Learning, Sustainable Development
Interest group: SIG 28 - Play, Learning and Development
Chairperson: Lucía Barrenetxea-Mínguez, University of Deusto, Spain

Assessment of divergent thinking through game based robotics

Keywords: Creativity/Divergent Thinking, Educational Technologies, In-service Teachers, Problem Solving
Presenting Author: Margarida Margarida Romero, Université Côte d'Azur, France

Problem solving through the use of game based robotics requires engaging in divergent and convergent thinking in order to create intermediate solutions. Divergent thinking is considered an important process in creativity research (Runco & Acar, 2012) and creative problem solving (Leroy et al. 2021). In this study, we focus on the analysis of divergent thinking (DT) in the CreaCube game based robotic task. We aim to evaluate DT in a situation of novelty (activity 1) and in a second instance of the task (activity) in which the participants are already familiar with the modular robots. We assess DT by adapting the Alternate Uses Test (AUT) (Guilford, 1967) operationalization of fluidity, flexibility and innovation in the context of a playful problem based activity with modular robotics played twice by 27 elementary education in-service teachers. Results show a higher fluidity (number of total figures built) in the second activity (A2), but a lower flexibility and innovation. Through the CreaCube task we expand the possibilities of assessing divergent thinking through “visuo-spatial constructive play objects” (VCPOs, Ness & Farenga, 2016) required in programming robots and STEM activities with technological components.

Gaming for environmental citizenship: A systematic literature review on behaviour change games
Keywords: Citizenship Education, Environmental Education, Game-based Learning, Sustainable Development
Presenting Author: Yiannis Georgiou, Cyprus University of Technology, Cyprus; **Co-Author:**Andreas Hadjichambis, Cyprus Center for Environmental Research & Education, Cyprus; **Co-Author:**Demetra Hadjichambi, Cyprus Center for Environmental Research & Education, Cyprus; **Co-Author:**Anastasia Adamou, Cyprus Center for Environmental Research & Education, Cyprus

As we are living amid an unprecedented environmental crisis, the need to cultivate more environmental citizens intensifies. Toward this direction, Behaviour Change Games (BGCs) have been argued as a viable venue to empower players’ Environmental Citizenship (EC). This review study examines whether empirical research in the field, covering the time span of the last fifteen years (2007-2021), provides evidence supporting the contribution of BCGs for EC. In total, 44 articles were reviewed, to shed light on the gaming elements and the persuasive strategies of the deployed BCGs, as well as on the EC actions facilitated by the BCGs and their impact on players’ EC competences. Our findings have pointed out that while BCGs seem to promote pro-environmental knowledge and attitudes, such an assertion is not fully warranted for pro-environmental behaviours. We reflect on our findings, and we provide future research directions to push forward the field of BCGs for EC.

Playing in the Museum. Influence of Students' Personal Epistemology on their Learning Experience.
Keywords: Critical Thinking, Game-based Learning, Knowledge Construction, Problem-based Learning
Presenting Author: Simon Morard, University of Geneva, Switzerland

This research investigates the subjectivity of a playful learning experience in a museum context. It focuses in particular on aspects related to the relationship to knowledge and the way students perceive their own play experience. Our work aims to model and study the playful learning experience, both from the point of view of the dimensions linked to play and to aspects relating to the relationship to knowledge (i.e. personal epistemology). Two digital games were designed to test our model, which identifies from a literature review, the main dimensions of a playful experience. This model is used as an analysis tool, completed by the study of audio and video traces collected during experimentation in the museum. The results allow us to identify how the players' personal epistemology is mobilized during their game experience, and how they appropriate the game as a particular learning experience.

Player types in digital learning systems - First results on the Gamification User Types Hexad Scale
Keywords: Computer-assisted Learning, E-learning/ Online Learning, Game-based Learning, Motivation
Presenting Author: Simon Schultze, University of Teacher Education St. Gallen, Switzerland; **Co-Author:**Jan Hochweber, St. Gallen University of Teacher Education, Switzerland

Gamification is used in a variety of application contexts, including digital learning systems. However, different users prefer different gamification elements. The popular Gamification User Types Hexad model (Marczewski, 2015) distinguishes six player types. A corresponding instrument, the Hexad scale, was developed and empirically studied by Tondello et al. (2016, 2019), but not specifically for digital learning systems. In this study, students in German-speaking Switzerland/Liechtenstein from 18 classes in the most academically demanding school type worked on the Hexad scale and reported on their preferences for gamification in a newly developed digital learning system (lernnavi). Based on confirmatory factor analyses, the data are analyzed with respect to fit to the Hexad model, complemented by latent profile analyses of the Hexad subscales to identify different player profiles.

Session D 15

23 August 2023 08:00 - 09:30
UOM_A10
Single Paper
Teaching and Teacher Education

Teaching and Assessing Mathematics

Keywords: Assessment Methods, At-risk Students, Attitudes and Beliefs, Competencies, Instructional Design, Mathematics/Numeracy, Meta-analysis, Pre-service Teachers, Self-efficacy, Synergies between Learning / Teaching and Research, Teacher Effectiveness, Teaching Approaches
Interest group: SIG 11 - Teaching and Teacher Education, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Clark Chinn, Rutgers University, United States

Focusing on Generic and Content-Specific Practices in Mathematics: A Meta-Analysis Spanning 50 Years
Keywords: Mathematics/Numeracy, Meta-analysis, Teacher Effectiveness, Teaching Approaches
Presenting Author: Charalambos Charalambous, University of Cyprus, Cyprus; **Co-Author:**Thekla Iakovou, University of Cyprus, Cyprus; **Co-Author:**Peng Peng, The University of Texas at Austin, United States

For years, scholars have been attending to either content-generic or content-specific teaching practices when trying to explain how teaching contributes to student learning in mathematics. Yet, during the past decade, there is increasing interest in attending to both, recognizing that both are needed for student learning. Despite this recognition, no meta-analysis that empirically examines this hypothesis seems to have been conducted, since most of the extant meta-analyses either attend to only one type of practice or, if they consider both, focus on proxies of those practices (e.g., student learning processes). Aiming to address this gap, the present meta-analysis drew on 175 studies conducted in mathematics over the past 50 years (1970-2020) to compare the contribution of content-generic and content-specific teaching practices to different types of student learning (mainly cognitive and affective). Toward this end, a content-generic framework (the Dynamic Model of Educational Effectiveness) and a content-specific framework (Mathematical Quality of Instruction) were utilized. Run using the “robumeta” package in *R,* the analysis showed both types of practices to contribute to student learning (cognitive and affective), with the content-specific practices having slightly higher effect sizes than those of the content-generic practices. Adding to a growing body of literature stressing the importance of attending to both types of practices, these results can have important implications for developing models to capture teaching quality, for exploring the effects of teaching quality on student learning, and for developing programs for teacher initial training and ongoing professional development.

Mathematics teacher educators’ perspective on teaching and collaboration in Chile
Keywords: Instructional Design, Mathematics/Numeracy, Pre-service Teachers, Synergies between Learning / Teaching and Research
Presenting Author: Paula Guerra, Universidad católica Silva henriquez, Chile; **Co-Author:**Helena Montenegro, Universidad de Chile, Chile; **Co-Author:**Flavio Guiñez, Universidad de Chile, Chile; **Co-Author:**Salome Martinez, Universidad de Chile, Chile; **Co-Author:**Constanza Ledermann, Universidad de Chile, Chile

The quality of preservice teacher education is relevant, and several studies have shown that teacher educators are crucial in this process. In Chile, an area of particular concern is mathematics teacher education due to low results in several evaluations. Although teaching is an individual task, research shows that collaboration is essential for educational improvement. In this context, the collaborative approach is relevant in teacher education. Design-based research

(DBR) is an approach that strengthens and improves teaching practices through collaboration between researchers and teacher educators.
This report will present results from the first and second years of four-year research. Nine mathematics teacher educators participate voluntarily. Data were collected through semi-structured interviews, and thematic analyses were conducted to identify patterns and recurring themes within the data. The preliminary analysis identified two main topics: ideas about teaching and collaborative practice among teacher educators. Participants express awareness of their role as a model about the first topic, but not all agree if they explicitly or implicitly model. Besides, the modeling process has a different emphasis. About the collaborative practice, teacher educators value this process. During the first year, a community was established among teacher educators and the research team, as DBR proposed, to redesign a math task. About this process, they highlight the development of flexibility in their classes, a focus on math, an exchange of ideas, and the improvement of their class. Participants also identified aspects that facilitate and difficult collaboration among teacher educators. Theoretical and practical implications will be discussed.

Multi-criterion noticing in mathematics education - A vignette-based study
Keywords: Assessment Methods, Competencies, Mathematics/Numeracy, Pre-service Teachers
Presenting Author: Sebastian Kuntze, Ludwigsburg University of Education, Germany; **Co-Author:**Marita Friesen, University of Education Heidelberg, Germany; **Co-Author:**Jens Krummenauer, University of Education Ludwigsburg, Germany

The complexity of mathematics classroom situations often requires mathematics teachers to notice and analyse aspects of the situation with respect to multiple criteria which can be meaningful for supporting the students' learning. Such so-called multi-criterion noticing requirements are likely to come with high cognitive load for the teacher, in particular for less experienced pre-service teachers. For multi-criterion noticing, teachers need multi-criterion awareness as well as corresponding professional knowledge in the relevant domains. Despite its importance for mathematics teacher expertise, studies approaching multi-criterion noticing in systematic ways are still scarce. Consequently, this study examines pre-service teachers' analyses of a classroom vignette, which had been designed to require noticing related to four different criteria which are relevant for the students' learning and understanding. The criteria were related to different mathematics education theory elements. The study explores the teachers' competence related to multi-criterion noticing and aims to find out whether the pre-service teachers' multi-criterion noticing can be fostered through an intervention focused in the relevant criterion knowledge elements. The findings include evidence on pre-service teachers' growth in multi-criterion noticing. Moreover, the empirical results also provide insight into pre-service teachers' difficulties, pointing to the complexity of multi-criterion noticing.

Student teachers' attitudes predict self-efficacy for teaching low-achieving students in mathematics
Keywords: At-risk Students, Attitudes and Beliefs, Mathematics/Numeracy, Self-efficacy
Presenting Author: Freya Winterle, University of Vienna, Austria; **Co-Author:**Nele Kampa, University of Vienna, Austria

Fostering mathematical abilities of all students in a heterogeneous setting can be viewed as a crucial part of school education. Inadequate basic mathematical abilities may hinder individual's participation in society. In order to adequately support every student, teachers need to provide differentiated instruction that fits varying needs and ability levels. Teachers' self-efficacy is an essential factor of their professional competence as well as for positive learning outcomes. Teachers' self-efficacy and positive attitudes towards education in STEM classrooms have been shown to be positively correlated. We investigate how student teachers attitudes towards teaching low-achieving students in mathematics and causal attributions regarding this student group are linked with their specific self-efficacy for teaching this group of students. Our sample consists of students in teacher training in Germany and Austria (N=188). By applying a structural equation model, we found a significant relation between student teachers' attitudes towards teaching low-achieving students in mathematics and their specific self-efficacy for teaching low-achieving students in mathematics (β =.26, p

Session D 16

23 August 2023 08:00 - 09:30
UOM_A11
Single Paper
Learning and Instructional Technology

Parents, Children and Digital Technologies

Keywords: Competencies, Digital Literacy and Learning, Early Childhood Education, Educational Technologies, Environmental Education, Game-based Learning, Informal Learning, Parental Involvement in Learning, Primary Education, Self-efficacy
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Evanna Ratner, Gordon Academic College, Israel

The digital home learning environment of toddlers
Keywords: Digital Literacy and Learning, Early Childhood Education, Environmental Education, Parental Involvement in Learning
Presenting Author: Sarah K Schröter, Otto-Friedrich University of Bamberg, Germany; **Co-Author:**Elisa Oppermann, University of Bamberg, Germany; **Co-Author:**Franziska Cohen, University of Education Freiburg, Germany; **Co-Author:**Luisa Prokupek, Otto-Friedrich-University of Bamberg, Germany; **Co-Author:**Sabine Blaurock, Otto-Friedrich-University of Bamberg, Germany; **Co-Author:**Yvonne Anders, Otto-Friedrich-University of Bamberg, Germany

Children's home learning environment (HLE) has received much attention over the past decade. Studies confirm the high impact of the HLE on children's learning outcomes, particularly on their language and numeracy skills (e.g. Anders et al. 2012; Sénéchal & LeFevre 2002). However, the HLE is changing as information communication technology (ICT) increasingly becomes an integral part of children's lives and, consequently, of the HLE. There is little empirical evidence on the impact of ICT use on the HLE of children. Some authors worry that ICT use may replace non-digital educational activities in children's HLE (e.g. Vilhelmson et al. 2018). Therefore, the present study investigates a possible relationship between children's HLE and their ICT contact and analyses potential factors influencing the digital HLE of children, for instance, parental ICT skills and beliefs. We analysed survey data from 209 participants with children between 6 to 18 months. Results revealed a positive relationship between the frequency of parent-child activities and active media use with the child (r=0.16*), while controlling for the child's age, the sum of people under 18 in the same household, gender, the highest degree of the participating parent, and family income. It appears that children experience either a rich home learning environment where parents frequently provide joint non-digital activities with complementary ICT use, or a relatively poor home learning environment with fewer non-digital activities and less ICT use.

Supporting children`s numeracy development in families: A digital intervention study
Keywords: Digital Literacy and Learning, Early Childhood Education, Educational Technologies, Game-based Learning
Presenting Author: Anna Mues, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Efsun Birtwistle, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Astrid Wirth, Ludwig-Maximilians-Universität München, Germany; **Co-Author:**Tina Schiele, Ludwig-Maximilians-Universität-München, Germany; **Co-Author:**Frank Niklas, Ludwig-Maximilians-Universität (LMU), Germany

Early numeracy competencies are of great importance for children´s later academic achievement. In addition to family characteristics, the home numeracy environment (HNE) plays a key role for children´s development. Here, digital interventions with learning apps on tablets offer the potential to approach families in a low-threshold manner and to support them regardless of their background.
In a field experiment, we investigated whether the provision of specific mathematical learning apps for kindergarten children and parental information about the HNE improves the quality of children´s numeracy competencies and the HNE. Children´s numeracy competencies were measured in two cohorts (N_1 = 190 children; M_{1age}= 63.6 months; SD_1 = 4.4; N_2 = 310; M_{2age}= 59.36; months; SD_2=3.94) at t1 and about six months later at t2. Parents were surveyed about demographic information and the HNE. Between t1 and t2, N_1= 65 and N_2 = 91 of the participating families received tablet computers with specific mathematical learning apps and parental information for a period of 5.5 months.
Our analyses showed no intervention effect for the quality of the HNE. However, group comparisons and regression analysis with the exact app usage times

showed significantly greater mathematical competency gains for children from intervention families even when controlling for child and family characteristics. The study demonstrates that pedagogically valuable learning apps can support children's development of numeracy competencies already at preschool age, however we need to think about further ideas how to reach the parents more adequately in order to increase the quality of the HNE.

Framework of parental restrictive mediation for using digital technologies at home
Keywords: Competencies, Digital Literacy and Learning, Parental Involvement in Learning, Primary Education
Presenting Author: Marit Puusepp, University of Tartu, Estonia; **Co-Author:**Margus Pedaste, University of Tartu, Estonia

Digital technology is widely used for achieving educational learning outcomes. However, research shows that access to digital technologies also results in their use for entertainment purposes. Therefore, parental restrictive mediation, in terms of rules and restrictions, is often applied to regulate technology use at home. However, not much is known about the different forms of restrictive mediation. The aim of this study is to propose a framework of parental restrictive mediation to describe the different categories of restrictions applied to regulate students' digital technology use.We collected data from students (n = 847; grades 3, 6, and 9) and their parents (n = 709) about their understanding of the rules and restrictions applied at home for using digital devices, platforms, content, and internet. We used inductive content analysis of open-ended questions to develop a framework of parental restrictive mediation. The proposed framework consists of four main categories (devices, platforms, content, and internet) and six sub-categories with a total of 39 different variables. Application of the framework revealed that it enables researchers to specify the variety of rules and their alteration through grades in basic school. The results showed that the most detailed rules at home concerned device use (e.g., time-restriction rules for smartphones) and that all restrictions were reduced with students' age. In future studies, analysis of how different restrictions may predict students' digital competence or academic learning outcomes could inform parents on how to set rules in a more meaningful way.

App-based Support for Parental Self-Efficacy in the First 1,000 Days: A Randomised Control Trial
Keywords: Early Childhood Education, Educational Technologies, Informal Learning, Self-efficacy
Presenting Author: Laura Outhwaite, University College London, IOE, United Kingdom

Parental self-efficacy is key for guiding parents' interactions with their child and is an important target for early intervention. This study reports a pilot randomised control trial (RCT) of a parenting application (app) with 79 parents of children aged 0-6 months in the UK. The app includes 1,026 daily age-appropriate activities across eight areas of child development, using resources accessible at home. While controlling for pre-test scores, parents who used the parenting app (Treatment Group) had significantly higher parental self-efficacy, after the 4-week intervention period, compared to the Active Control Group. Partial correlation analyses indicated that higher frequency of self-reported use of the parenting app was associated with greater parental self-efficacy outcomes. This evidence establishes proof of concept that parenting apps can have significant benefits on parental self-efficacy in early childhood. Limitations to the interpretation and generalisation of the findings, as well as directions for future research are discussed.

Session D 17

23 August 2023 08:00 - 09:30
UOM_A04
Single Paper
Assessment and Evaluation, Learning and Special Education

Special Educational Needs: Deaf and Hard of Hearing Children, Numeracy and SRL Difficulties

Keywords: Classroom Assessment, Cognitive Skills and Processes, Comprehension of Text and Graphics, Inclusive Education, Mathematics/Numeracy, Quantitative Methods, Secondary Education, Self-efficacy, Self-regulated Learning and Behaviour, Special Education
Interest group: SIG 01 - Assessment and Evaluation, SIG 15 - Special Educational Needs
Chairperson: Mark Smith, United States

How adults with and without deafness process idioms: Direct retrieval or compositional analysis?
Keywords: Cognitive Skills and Processes, Comprehension of Text and Graphics, Inclusive Education, Special Education
Presenting Author: Inmaculada Fajardo, Department of Developmental and Educational Psychology/Reading Research Unit, Spain; **Co-Author:**Nadina Gómez-Merino, University of Valencia / Interdisciplinary Research Structure for Reading Research (ERI Lectura), Spain; **Co-Author:**Marta Vergara, Department of Developmental and Educational Psychology/Reading Research Unit, Spain; **Co-Author:**Antonio Ferrer, Department of Developmental and Educational Psychology/Reading Research Unit, Spain

Little is known about how individuals with deafness process some kind of figurative language like idioms whose meaning could be directly retrieved from memory when they are very familiar (as opposed to the compositional analysis of each individual idiom word). Direct retrieval could benefit readers who rely more in direct lexical access like people with prelingual deafness (Belanguer & Rayner, 2015). This proposal describes an ongoing study in which 24 adults with and without prelingual deafness read familiar and literally plausible idioms (break the ice) embedded in literal vs. figurative context. Idiom's congruency was also manipulated by including a non-related word at the end of the idiom (target word: ice/pulp). Participants eye movements on the target and post-target regions were monitored. Results showed a main effect of group for the target and posttarget areas with hearing participants showing shorter fixation times than participants with deafness. We also observed a facilitative idiomacity effect for both groups in the post-target area which was fixated shorter when it was preceded by idiomatic than by literal contexts. The incongruency effect in the target region (higher fixation times in the incongruent words) was significant for both groups in the literal context condition but not in the idiom condition. Altogether, these results suggest that both groups relied more on direct retrieval of idioms than on the compositional analysis. Nonetheless, when the context induces a literal interpretation, participants were able to change to an idiom compositional analysis (word by word) as shown by slower reading times.

Formative assessment in inclusive mathematics education in secondary schools: A systematic review
Keywords: Classroom Assessment, Inclusive Education, Mathematics/Numeracy, Secondary Education
Presenting Author: Fynn Töllner, Leuphana University of Lueneburg, Germany; **Presenting Author:**Kyra Renftel, Leuphana University Lueneburg, Germany; **Co-Author:**Poldi Kuhl, Leuphana Universität Lüneburg, Germany; **Co-Author:**Michael Besser, Leuphana Universität Lüneburg, Germany

Formative assessment can be used to put individualisation in place. When it comes to inclusive teaching in secondary school mathematics education, little is known about how to design and implement such a formative assessment. This paper addresses this research gap by conducting a systematic review on formative assessment for an inclusive mathematics education in secondary schools. For this purpose, we searched selected literature databases and identified 16 relevant articles. 14 of these 16 articles were from the United States, one from Switzerland, and one from Austria. They were published between 1990 and 2020. The identified publications include (systematic) reviews as well as quantitative, qualitative and non-empirical work. The systematic analysis of these publications was done with respect to formative assessment in general as well as its both main components, namely diagnostics and feedback. The analysis indicates, that in terms of formative assessment in general, teachers should be supported with information on how to deal with their students' diagnosed mistakes. While diagnosing achievement it should be considered, that students with different conditions differ in their preferred approach to a subject matter and the mistakes they make. While giving feedback, students with mathematical disabilities benefit from a graphical representation of their performance development, as this can help to motivate them. After presenting the main results, we will discuss limitations and implications of the conducted review. We will put special emphasis on the meaning of the results for the future implementation of formative assessment practices in inclusive mathematic teaching at (German) secondary schools.

Interconnectedness between students' self-efficacy in self-regulation and strengths
Keywords: Quantitative Methods, Self-efficacy, Self-regulated Learning and Behaviour, Special Education
Presenting Author: Minna Ikävalko, University of Eastern Finland, Finland; **Co-Author:**Erkko Sointu, University of Eastern Finland, Finland; **Co-Author:**Jaana

Viljaranta, University of Eastern Finland, Finland; **Co-Author:**Matthew Lambert, University of Nebraska-Lincoln, United States

Students' self-perceptions of own abilities to regulate and assess behaviours, emotions and thinking have been seen to strongly influence students' educational and psychosocial development. To investigate self-perceptions more in depth, we need to recognise the interpretations (e.g., doubts and confidence) students hold about their accomplishments in learning situations. We examined 9–16-year-old students' (N= 599) self-perceptions from the viewpoints of the sources of self-efficacy in self-regulation and behavioural and emotional strengths. Independent sample *t*-tests were used to examine whether students' age or received pedagogical support played a role in their self-perceptions of abilities and strengths. Pearson's correlation coefficients were used to examine whether these two viewpoints are related to each other. First, we found that primary school students perceived their sources of self-efficacy in self-regulation and strengths more positively than lower secondary school students. However, previous experiences of stress and anxiety in task situations did not differ between the school levels. Second, among primary school, pedagogical support did not play a significant role in how students perceived their abilities and strengths, whereas in lower secondary school, significant differences in several measured areas were found. Third, we found that the sources of self-efficacy in self-regulation and strengths were related in both primary and lower secondary school settings. The results indicate that students interpret learning situations differently in relation to age, and in lower secondary school in relation to pedagogical support. Additionally, results revealed that the connection between the sources of self-efficacy in self-regulation and strengths can be found empirically.

Session D 18

23 August 2023 08:00 - 09:30
UOM_A05
Single Paper
Cognitive Science, Instructional Design, Learning and Instructional Technology

Computational Thinking and Scientific Decision-making

Keywords: Achievement, Assessment Methods, Competencies, Computational Thinking, Creativity/Divergent Thinking, Instructional Design, Learning Strategies, Primary Education, Science and STEM, Science Education, Secondary Education, Teacher Effectiveness, Teacher Efficacy, Teaching/Instructional Strategies
Interest group: SIG 06 - Instructional Design, SIG 18 - Educational Effectiveness and Improvement, SIG 28 - Play, Learning and Development
Chairperson: Maria Öhrstedt, Stockholm University, Sweden

Effects of different learning environments on students' socio-scientific decision-making.
Keywords: Instructional Design, Learning Strategies, Science Education, Teaching/Instructional Strategies
Presenting Author: Maria Tsapali, University of Bristol, United Kingdom; **Co-Author:**Michelle Ellefson, University of Cambridge, United Kingdom

An ongoing debate within educational and psychological circles is the effectiveness of constructivist teaching methods over direct instruction. This study, through two supplementary examples, explores the effects of three different learning environments (explicit instruction, guided discovery and unguided discovery) on primary school students' socio-scientific decision-making. Experiment 1 allows a comparison between three learning conditions so as to identify which one produces better learning outcomes for students, while Experiment 2 provides depth and context in the question under study by capturing the reasons behind the differences of the three learning conditions. Experiment 1 adopts an experimental pre-test post-test design and classroom-based interventions with a sample of 190 11-year-old students from four primary schools in Greece. The results show that explicit instruction and guided discovery were significantly more effective than unguided discovery. When taking into account achievement level, though, only explicit instruction closed the achievement gap, while guided discovery favoured high-achieving students. Experiment 2 employs one-to-one think-aloud tasks with 30 students to capture their reasoning while they are engaging in socio-scientific decision-making. The results show that students in the Explicit instruction tended to pay more attention to the process they were following and listed the next steps, as well as they provided more explanations on their rationale when making a decision. Taken together, the results of the two experiments suggest that explicit instruction is the most effective learning environment to introduce socio-scientific decision-making in mix-level primary classrooms.

Robotics and programming in primary education: a teacher-led classroom intervention.
Keywords: Computational Thinking, Primary Education, Science and STEM, Teacher Efficacy
Presenting Author: Amy Hughes, Cardiff University, United Kingdom; **Co-Author:**Sarah Gerson, Cardiff University, United Kingdom; **Co-Author:**Johanna van Schaik, Radboud University Nijmegen, Netherlands

Recent advances in tangible technologies (e.g., educational robotics) have enabled the introduction of programming and computational thinking concepts in early-childhood classrooms. Simultaneously, research continues to illustrate the benefits of introducing these ideas as early as possible once children begin formal schooling. This study aimed to implement a 6-week robotics intervention within primary school classrooms. We then investigated the impact of this curriculum on children's skill development and teachers' self-efficacy. In total, 430 children (aged 4 – 7 years) and 13 teachers across 7 primary schools participated in this study. In a pre-test post-test design, schools were assigned to one of three conditions: control (i.e., No intervention), classroom intervention (Intervention), or classroom intervention plus teacher training (Intervention+). Several pupil measures were taken pre and post-intervention. These included assessments of programming (including algorithm construction, prediction and debugging), visual perspective taking, sequencing and executive functioning. Teacher attitude and self-efficacy measures were also collected throughout the study. Data analysis is ongoing; however, we aim to explore whether there were improvements in pupils' abilities pre and post-intervention and whether these improvements differ across the three conditions. Multilevel modelling methods will allow us to control for group factors (i.e., school attended and year group) that may influence outcomes at the individual level. When exploring improvements in programming (specifically algorithm construction), preliminary findings suggest that improvements between the three conditions did not differ significantly. However, it appears that age effects are present, with older children improving more than younger children.

Quality and equity in computational thinking education: the relationship with teachers' practices
Keywords: Achievement, Computational Thinking, Secondary Education, Teacher Effectiveness
Presenting Author: Sara Monteyne, KU Leuven - Centre for educational effectiveness and evaluation, Belgium; **Co-Author:**Charlotte Struyve, KU Leuven - Centre for educational effectiveness and evaluation, Belgium; **Co-Author:**Johan van Braak, Ghent University, Belgium; **Co-Author:**Koen Aesaert, K.U.Leuven, Belgium

The aim of this study is to investigate whether teachers' classroom practices (i.e., the extent to which teachers focus on teaching computational thinking skills in class) have the potential to foster student achievement in computational thinking and whether these practices can reduce differences in student computational thinking achievement according to students' background characteristics. A regression analysis with a two-level design was conducted on country specific data of Germany from the International Computer and Information Literacy study (ICILS) 2018. The results indicate that students who are regularly given the opportunity to practice computational thinking skills in the classroom have a higher score on the computational thinking scale. However, in the sample of German schools, these classroom practices do not seem to have the potential to reduce achievement gaps between students.

Associations between Creativity & Computational Thinking in Primary School: Computational Creativity
Keywords: Assessment Methods, Competencies, Computational Thinking, Creativity/Divergent Thinking
Presenting Author: Ann-Kathrin Jaggy, Hector Research Institute of Education Sciences and Psychology, Germany; **Co-Author:**Katerina Tsarava, Hector Research Institute of Education Sciences and Psychology, Germany; **Co-Author:**Manuel Ninaus, University of Graz, Institute of Psychology, Austria; **Co-Author:**Mathias Benedek, University of Graz, Institute of Psychology, Austria; **Co-Author:**Korbinian Moeller, Loughborough University, Mathematics Education Centre, United Kingdom

Computational thinking (CT) has been considered an important 21st century STEM competence, that is crucial for present and future generations to meet the demands of the future digital world. Equally important to solving problems is creativity, i.e. the ability to provide innovative solutions. Both CT and creativity are

built upon cognitive thinking processes that contribute to knowledge construction and are involved in problem-solving. However, little is known about their association. The aim of the present study is to build a robust basis for future research on how domain-general creativity and CT are related and to investigate the extent to which domain-general creativity and CT transfer to creativity in the CT context (Computational Creativity). *N*=136 primary school children participated in the cross-sectional study. Standardized tests were used to assess various facets of computational thinking and domain-general creativity. Additionally, a newly developed measurement instrument for the assessment of creativity within a CT-context (i.e., Computational Creativity) was used. The results of the preliminary analyses confirm a positive relationship between Computational Thinking and individual facets of domain-general creativity (r=.25 - .47). Further, the multiple regression analyses revealed that computational thinking is an important factor for (the divergent aspect of) computational creativity (β = .24 - .41; p < .05). Domain-general creativity partly predicted computational creativity in third and fourth graders (β = .20 -.23; p < .05), thus also not consistent across all assessed facets nor across grade levels. The results are discussed in terms of a potentially promising approach for future STEAM education.

Session D 19

23 August 2023 08:00 - 09:30
UOM_R05
Single Paper
Assessment and Evaluation, Teaching and Teacher Education

Classroom Assessment and Feedback

Keywords: Assessment Methods, Classroom Assessment, Feedback, Peer Interaction, Secondary Education, Self-regulated Learning and Behaviour, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 01 - Assessment and Evaluation, SIG 11 - Teaching and Teacher Education
Chairperson: Alex Kozulin, Achva College and Feuerstein Institute, Israel

Student Self-Assessment and Feedback in Singapore Primary Schools: Engaging Teachers and Students
Keywords: Assessment Methods, Classroom Assessment, Feedback, Teaching/Instructional Strategies
Presenting Author: Hwei Ming Wong, National Institute of Education/Nanyang Technological University, Singapore, Singapore

The Singapore Ministry of Education (2009) has been promoting the use of assessment and feedback to enhance students' learning, as seen in national policies such as the Primary Education Review and Implementation Holistic Assessment (PERI HA) initiative.
The present study examined primary school teachers' implementation of student self-assessment through their teacher learning communities, types of teacher-student feedbacks and benefits of student self-assessment from teachers' and students' perspectives. A total of 13 teachers and their 318 students in four primary schools participated in this study. The teachers attended a series of workshops, aimed at equipping them with skills and knowledge about student self-assessment and feedback. The teachers also participated in focus group discussions (FGDs). Their students participated in a questionnaire and five students from each teacher's class were also randomly selected to participate in FGDs to share their perceptions and experiences of self-assessment and feedback. We will discuss the findings from this study and share recommendations on moving forward assessment and feedback practices in schools.

Feedback in Singapore Classrooms: Findings on Assessment, Knowledge and Interactions Across 15 Years
Keywords: Assessment Methods, Classroom Assessment, Feedback, Teaching/Instructional Strategies
Presenting Author: Dennis Kwek, National Institute of Education/Nanyang Technological University, Singapore, Singapore

The paper provides insight into the nature of teaching and learning in Singapore primary and secondary classrooms over the past 15 years, with a particular focus on the relationships between feedback, epistemic knowledge and interactional structures. Since the introduction of Thinking Schools, Learning Nation (1997) and Teach Less, Learn More (2005) educational policies into the Singapore education system, classroom pedagogies have changed in direct, and indirect, responses to these policies and other sociocultural forces impacting the education system. The CORE Research Programme (CORE) began in 2004 with the purpose of providing a social science research evidence base to document, measure and monitor the pedagogical shifts in primary and secondary classrooms across a range of subject domains in Singapore schools. The paper will focus on assessment and feedback practices of teachers in these classrooms and subject domains, examining the changes in these practices, how they have been shaped by shifts in epistemic knowledge foci and interactional structures, and why tensions continue to persist in the school system for assessment and feedback reforms.

Differences between assessor and assessee outcomes in peer assessment: A systematic review.
Keywords: Assessment Methods, Classroom Assessment, Feedback, Peer Interaction
Presenting Author: David Zamorano, Universidad de Deusto, Spain; **Co-Author:**Maryam Alqassab, Universidad de Las Palmas de Gran Canaria, Spain; **Co-Author:**Ernesto Panadero, Universidad Deusto, Spain

The peer assessment research has focused on (1) one role (assessor or assessee) or (2) peer assessment as a whole. However, to better understand how students learn from peer assessment, it is necessary to acknowledge the differences between the two roles, assessor and assessee, to support learners in each role. The present study aims to investigate the existing evidence about the differences between the assessor's and assessee's cognitive and non-cognitive outcomes of peer assessment. A systematic literature review was conducted, searching ERIC and PsycINFO (ProQuest) databases, using eight different terms related to peer assessment (e.g., peer feedback). We found 25 studies that met the inclusion criteria. The studies selected had to (1) be conducted in a formal educational setting (primary, secondary, and higher education), (2) carry out fieldwork with a sample (experiments, quasi-experiments, response to questionnaires, interviews), (3) be written in English (4) and report differences in assessor or assessee cognitive or non-cognitive outcomes. Preliminary results shows that 68% (17) studies report differences on cognitive and 32% (8) on non-cognitive outcomes. More than half of the studies focused on cognitive outcomes point towards higher cognitive outcomes for the assessors (eg. learning, performance and writing hability). Meanwhile, mixed results are reported on the studies focused on non cognitive outcomes. Further analysis of the differences between assessors and assessees cognitive and non cognitive outcomes will be reported. Implications of the study fundings on how to consider the roles of assessor and assessee when implementing peer assessment in classroom settings will be discussed.

Teachers stimulating self-regulated learning via co-regulated formative assessment practice
Keywords: Classroom Assessment, Secondary Education, Self-regulated Learning and Behaviour, Teacher Professional Development
Presenting Author: Marijke Veugen, Wageningen University and Research Centre, Netherlands; **Co-Author:**Judith Gulikers, Wageningen University, Netherlands; **Co-Author:**Perry den Brok, Wageningen University & Research, Netherlands

Many teachers want to stimulate students to self-regulate their learning by applying formative assessment (FA) in the classroom. While the interaction between teacher and student are key in the FA process, not many research has been done yet in how teachers co-regulate the FA process to stimulate self-regulated learning (SRL) of students. In this study the main question was: How do teachers plan and implement (co-regulated) FA activities and what (matched) FA behaviour did students show? The FA cycle was used as framework to describe the FA process in five phases: 1. Clarifying expectations, 2. Eliciting student responses, 3. Analysing and interpreting responses, 4. Communicating about responses and 5. Taking follow-up actions: Adjusting teaching and learning. In total fourteen teachers planned and implemented co-regulated FA activities to stimulate students' SRL. Results showed that teachers implemented more FA activities to stimulate SRL than they planned. Results also showed what co-regulated FA activities looked like for each of the five phases of the FA cycle. With these results teachers and researchers are better able to recognize and implement co-regulated FA practice to stimulate students' SRL.

Session D 20

23 August 2023 08:00 - 09:30
UOM_A06

Single Paper
Instructional Design

Moral, Democratic and Citizenship Education

Keywords: Citizenship Education, Critical Thinking, Ethics, Instructional Design, Knowledge Construction, Morality and Moral Development, Pandemic, Parental Involvement in Learning, Primary Education, Qualitative Methods, Science and STEM, Secondary Education
Interest group: SIG 13 - Moral and Democratic Education
Chairperson: Auli Toom, University of Helsinki, Finland

Impact of a Media Literacy Intervention on Primary School Pupils' Ability to Recognize Fake News
Keywords: Citizenship Education, Critical Thinking, Primary Education, Science and STEM
Presenting Author: Genevieve Allaire-Duquette, Université de Sherbrooke, Canada; **Co-Author:**Abdelkrim Hasni, Université de Sherbrooke, Canada; **Co-Author:**Josée Nadia Drouin, Agence Science-Presse, Canada; **Co-Author:**Anne Gaignaire, Le Curieux, Canada; **Co-Author:**Audrey Groleau, Université du Québec à Trois-Rivières, Canada; **Co-Author:**Jean-Philippe Ayotte-Beaudet, Université de Sherbrooke, Canada

Few studies have explored children's experience with fake news. Those who have done so measured their ability to identify fake news and report that the percentage of primary school pupils recognizing fake news is alarming low. However, the effect of educational interventions remains poorly documented. The aim of this study is to explore the impact of a media literacy intervention on primary school pupils' ability to recognize fake news, on their fake news self-efficacy, and on their views of science news. To fulfill our objective, we will use a pretest–posttest design to compare fake news self-efficacy and views of science news in a sample of 200 pupils from 9-12 y.o. The posttest will also include a fake news identification task. Following the analysis of the data from the pretest-posttest questionnaires, contrasted cases will be further explored through qualitative research interviews that will address real-life use of fake news identification skills, likelihood of sharing fake news, perceived importance of fake news identification skills and news media consumption habits. Data collection is underway. We expect that fake news identification capabilities should be significantly greater than what is reported in descriptive studies (4-35%). We also expect fake news self-efficacy and views of science news to increase significantly. During the presentation, results will be discussed to propose guidelines for the design and implementation of intervention strategies that can effectively fight the proliferation of incorrect information online.

Friendship as political virtue: a project of citizenship education with middle school children
Keywords: Citizenship Education, Ethics, Qualitative Methods, Secondary Education
Presenting Author: Rosi Bombieri, University of Verona, Italy; **Co-Author:**Luigina Mortari, University of Verona, Italy; **Co-Author:**Marco Ubbiali, University of Verona, Italy

The contribute presents "The MelArete project", which is structured in: a) an educative pathway aimed at involving middle school children in reflecting and dialoguing on political virtues, i.e. the ones which give form to an engaged citizenship, and b) a qualitative research on the realized educative activities aimed at rigorously evaluating their effectiveness in fostering the children's ethical flourishing. The project can be defined as an "educative" research and not only "educational", because it is designed in order to offer good experiences to the participants and precisely these educative experiences become the source of the data collection. We will present the theoretical framework of the project, the design of the educative pathway and the heuristic process that involved 52 children of a middle school in the North of Italy. The presentation will focus on the activities concerning the virtue of friendship, that, according to Aristotle, is the main political virtue, and on the definitions that the participants gave to it. These definitions were analyzed following a methodological crossbreeding between the phenomenological method (Husserl, 2012) and the grounded theory (Glaser & Strauss, 1967). Findings, which show the richness of the children's ethical thinking, highlight how the children conceptualize and experience friendship.

Implementing VaKE in Science Education in different age groups
Keywords: Citizenship Education, Instructional Design, Knowledge Construction, Morality and Moral Development
Presenting Author: Panagiota Christodoulou, University of Western Macedonia, Greece; **Co-Author:**Dimitris Pnevmatikos, University of Western Macedonia, Greece; **Co-Author:**Georgios Malandrakis, Aristotle University of Thessaloniki, Greece; **Co-Author:**Evmorfia Garyfallogianni, University of Western Macedonia, Greece; **Co-Author:**Pantelis Kizos, University of Western Macedonia, Greece

It is argued that some instructional designs are suitable for some age groups but not others. The paper addresses whether V*a*KE as an instructional approach could be equally efficient in primary and tertiary education. Three implementations of V*a*KE in science education will be presented; one at the level of primary and two at the tertiary education. The main research question of each instruction was whether implementing V*a*KE could promote both values education and sustainability education. The first was in teaching science education. A V*a*KE dilemma was addressed in a class of 81 elementary school students. The dilemma discussion aimed to promote the concept of nanotechnology and lasted 5 weeks. The second dilemma was addressed in a class of 15 University students. The dilemma discussion aimed, again, to promote the concept of nanotechnology and sustainability and lasted three weeks. The third V*a*KE dilemma discussion was addressed in a class of 27 university students. The dilemma discussion aimed to promote the water footprint understanding and lasted 3 weeks. Comparisons showed significant improvements in conceptual understanding and sensitivity to environmental issues and the connection between values and science or sustainability education. Similarities and differences between the instruction with V*a*KE in elementary and tertiary education are discussed.

Covid-19 pandemic as an opportunity for shaping civic identity among youth.
Keywords: Citizenship Education, Pandemic, Parental Involvement in Learning, Qualitative Methods
Presenting Author: Lars Birger Davan, OsloMet, Norway

March, April, and May 2020 represent disrupting events, followed by serious restrictions on people's lives, in Norway, as well as in many other countries in the world. The global Covid-19 pandemic had a significant impact on education, work life and spare time. Norwegian adolescents were called to give up personal freedoms and to stay home to limit the spread of the virus. Our study aims to find out how young people's civic identity was affected during the pandemic. Through interviews with forty adolescents aged 14-15, our study finds that economic, cultural, and emotional resources in the family are significant factors for establishing and maintaining a civic identity among adolescents. By giving up personal freedom, many young people experienced unique constructs of civic identity, where civic participation goes beyond specific political aims, some see that personal sacrifice of freedom is of the greater good for the whole society and humanity, while others are frustrated for losing their civic life, yet others are feeling lost having little understanding of the context of their loss.

Session D 21

23 August 2023 08:00 - 09:30
UOM_R09
Single Paper
Cognitive Science, Learning and Instructional Technology, Motivational, Social and Affective Processes

Reading: Motivational Aspects

Keywords: Bilingual Education, Competencies, Comprehension of Text and Graphics, Computer-assisted Learning, Goal Orientations, Motivation, Primary Education, Reading, Self-concept, Self-regulated Learning and Behaviour, Teacher Professional Development
Interest group: SIG 21 - Learning and Teaching in Culturally Diverse Settings, SIG 27 - Online Measures of Learning Processes
Chairperson: Justine Stang-Rabrig, TU Dortmund University, Germany

Increasing task-oriented reading skills of lower comprehenders on inferential questions
Keywords: Comprehension of Text and Graphics, Computer-assisted Learning, Primary Education, Reading
Presenting Author: Ruth Villalon, University of Cantabria, Spain; **Co-Author:**Marian Serrano-Mendizábal, University of Valencia / Interdisciplinary Research

Structure for Reading (ERI Lectura), Spain; **Co-Author:**Ángeles Melero, University of Cantabria, Spain; **Co-Author:**Belén Izquierdo-Magaldi, University of Cantabria, Spain

Students usually read texts to answer questions, but many of them struggle to answer the inferential ones. Literature supports strategy instruction to improve low-comprehenders' skills; however, answering questions involves self-regulation strategies that go beyond those needed to understand a text. Although many computer-based interventions have focused on teaching strategies to foster lower-skilled text comprehension, the role of strategy instruction in task-oriented reading has not been examined. In this study we used an intelligent tutoring system based on strategy instruction to improve below-average comprehenders' task-oriented reading skills. We explored its efficacy in both, textbase and situation model levels of comprehension, comparing it with training based on question-answering practice. Results showed that although just practicing question answering may be enough to improve text-based scores, strategy instruction seems to be necessary to improve low comprehender students' skills to answer situation model questions.

Implementation of professional development trajectories for reading instruction.
Keywords: Motivation, Primary Education, Reading, Teacher Professional Development
Presenting Author: Lisa van der Sande, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Marjolein Dobber, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Jedidja Meima-den Breejen, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Roel van Steensel, Erasmus University Rotterdam, Netherlands

Aim. The aim of the current study was to examine the implementation quality of two professional development (PD) programs focused on reading instruction. One difference between these programs lies in the space for teacher agency, which may affect implementation quality. We examined whether the PD programs complied with characteristics of effective PD and effective reading instruction. Methodology. Two coding schemes and a questionnaire were developed to investigate three levels of implementation quality, namely the transfer of program content from the teacher educator to the teachers (delivery), how teachers perceived PD (receipt), and the extent to which teachers applied the content of PD in teaching practice (enactment). Findings. Regarding delivery, findings indicate that more characteristics of effective PD were visible in the high-agency PD than in the low-agency PD. For instance, more powerful and concrete practical examples were used in the high-agency PD program. Furthermore, in the high-agency PD, more attention was paid to effective instruction on reading motivation and comprehension. No differences between the PD programs were found in attention for decoding skills and vocabulary. Data of receipt and enactment are currently being analyzed and will be presented at the conference. Theoretical and Educational Significance. The instruments that were developed in the present study may be used more widely to investigate the implementation of PD programs. Additionally, the results of the current study provide more insight into the role of teacher agency in the implementation of PD.

Development of self-regulation searching processes while answering text-based pre-questions
Keywords: Goal Orientations, Primary Education, Reading, Self-regulated Learning and Behaviour
Presenting Author: Noemi Skrobiszewska, University of Valencia / Interdisciplinary Research Structure for Reading Research (ERI Lectura), Spain; **Co-Author:**Marian Serrano-Mendizábal, University of Valencia / Interdisciplinary Research Structure for Reading (ERI Lectura), Spain; **Co-Author:**Eduardo Vidal-Abarca, Universidad de Valencia, Spain; **Co-Author:**Paul van den Broek, Leiden University, Netherlands

In task-oriented reading situations, as answering a question, the task gives some clues about the relevance of the information in the text. Some questions give more explicit cues as word overlap between the question and the text (shallow questions) and others are not as explicit and require to make inferences. Research shows that skilled readers adapt their reading processes to different level questions but less is known about younger readers. In this study, we examined how readers of different ages adapt their reading processes in order to answer shallow and testing pre-questions. Our results indicate that readers as young as 4^{th} graders self-regulate their reading behavior, like older readers, adapting it to the question level except for the search of relevant information, in which they seem to struggle.

Effects of the reading self-concept in relation to multilingualism
Keywords: Bilingual Education, Competencies, Reading, Self-concept
Presenting Author: Daria Ferencik-Lehmkuhl, University of Cologne, Germany; **Co-Author:**Michael Schurig, TU Dortmund University, Germany; **Co-Author:**Nils Jaekel, University of Oulu, Finland; **Co-Author:**Sandra Schwinning, University of Wuppertal, Germany

The academic self-concept is one of the most thoroughly studied educational-psychological variables. It is empirically well established that the relationship between academic self-concept and achievement is reciprocal (i.e., mutually reinforcing; Marsh et al., 2005). This also applies to the reading self-concept as a part of the verbal self-concept and reading literacy (Goy et al., 2017). But too little is known about the effects of the reading self-concept in relation to performance in different subjects and multilingualism. In our study with fifth grade students (N = 3152) from 31 higher secondary schools (Gymnasium) in the state of North-Rhine Westphalia, Germany, we address the explorative question of the potential variance of the effects of reading self-concept on performance in German, English and mathematics by multilingualism while also considering the role of students' background, i.e., sex, and cultural capital.Results showed that the reading self-concept has a relevant positive influence on the abilities in German, English and Mathematics in the fifth grade of the higher secondary school track. Multilingualism on the other hand showed negative effects in German and Math. Both findings fit well within the national research canon.

Session D 22

23 August 2023 08:00 - 09:30
UOM_R01
Poster Presentation
Higher Education, Learning and Instructional Technology, Motivational, Social and Affective Processes, Teaching and Teacher Education

Motivation, Educational Technologies and Teaching Approaches

Keywords: Artificial Intelligence, Doctoral Education, Educational Technologies, Engagement, Goal Orientations, Higher Education, Mathematics/Numeracy, Motivation, Quantitative Methods, Secondary Education, Self-determination, Teaching Approaches, Well-being
Interest group: SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 08 - Motivation and Emotion
Chairperson: Lena Sofie Kegel, Germany

The Perception and Effect of Autonomy Support from Artificial Intelligence
Keywords: Artificial Intelligence, Educational Technologies, Motivation, Self-determination
Presenting Author: Juming Jiang, The University of Hong Kong, Hong Kong; **Co-Author:**Ayumi Tanaka, Doshisha University, Japan

This study examined how students perceive autonomy support from Artificial Intelligence (AI) and whether its effect differs from that of autonomy support from humans. It was furthermore investigated whether the use of face photographs improved how students perceive autonomy support from AI. A total of 156 Japanese undergraduates made voice calls in English to human partners or humans who pretended to be AI. Results indicated that students perceived their partners as autonomy-supportive even when they believed that their partners were AI, but they were significantly lower than those who thought another human supported them. Moreover, presenting face photographs improved perceived autonomy support and its effect on needs satisfaction and motivation to speak English. The results revealed both the potential and limitations of using AI to support autonomy in an education setting.

Doctoral Students' Language Preference and Motivation for Publication in Japan
Keywords: Doctoral Education, Higher Education, Motivation, Quantitative Methods
Presenting Author: Cheng Wenjuan, Hiroshima University, Japan

English is adopted as a *lingua franca* by non-native English speakers for academic purposes. Several studies have investigated the numerous reasons why non-native English speakers choose to publish in English; some researchers who preferred to publish in English were more motivated by the need to be recognized and rewarded for their work. However, little is known regarding the language choices of doctoral students for publication. This study aimed to investigate

doctoral students' language preferences and their motivation to publish in a preferred language. Data from a public university in Japan were collected using a questionnaire. This paper offers novel insights into doctoral students' strategic language choice for scholarly output based on local, institutional, and international motivations. Moreover, it discusses the relationship between doctoral students' language choices and motivations. The study contributes to our understanding of degree student experiences, second language academics' motivations, and support for doctoral students' academic publishing.

Associations between perfectionistic profiles and motivational profiles
Keywords: Goal Orientations, Motivation, Quantitative Methods, Well-being
Presenting Author: Antti Pulkka, National Defence University, Finland; **Co-Author:**Heta Tuominen, University of Eastern Finland, Finland; **Co-Author:**Markku Niemivirta, University of Eastern Finland, Finland

In this study we focused on the associations between perfectionism and achievement goal orientations. The aim was to examine what kinds of profiles of perfectionistic tendencies and achievement goal orientations could be identified among university students (n=173), and how these profiles were associated with each other.We identified four perfectionistic profiles: concerned (relatively low standards, high concerns; 12.7 %), non-perfectionist (low standards, relatively low concerns; 24.9 %), perfectionist (relatively high standards and concerns; 28.3%), and ambitious (relatively high standards, low concerns; 34.1 %). Further, four achievement goal orientation profiles were identified: avoidance-oriented (focus on performance-avoidance and work-avoidance; 6.9%), performance-oriented (focus on performance orientations; 32.4%), disengaged (no clear focus on any orientation; 26%), and mastery-oriented (focus on mastery-orientations; 34.7%). The connections between perfectionistic profiles and achievement goal orientation profiles showed that it was typical for the concerned students to hold either the avoidance-oriented or the performance-oriented motivational profile, and for the ambitious to hold the mastery-oriented profile. Then again, it was untypical for the concerned to have the mastery-oriented profile and for the ambitious it was untypical to have the performance-oriented profile.It seems that a focus on concerns is related to more maladaptive patterns of achievement-related goals, when compared to a focus on high strivings without concerns.

How digital mathematics curricula can affect performance: A focus on motivational features
Keywords: Educational Technologies, Mathematics/Numeracy, Motivation, Secondary Education
Presenting Author: Margaret Bowman, Miami University, United States; **Co-Author:**Kui Xie, The Ohio State University, United States

Motivation for mathematics, a predictor of performance, often declines during middle school. To improve performance, we need to influence motivation. This study examines how digital mathematics curriculum that incorporates specific features – authenticity, interactivity, and ease of use – may influence the motivational factors utility value and expectancies, which may lead to greater performance. Quantitative measures were gathered in two ways: through surveys to determine students' perceptions of a specific digital mathematics curriculum, their utility value beliefs about mathematics, and their expectations of success in mathematics; and through post-test measures to determine mathematical performance on a test of application knowledge. Using path analysis, the researcher found that authentic and easy to use curriculum is related to students' utility value and expectations of success, and that higher expectations of success predict higher performance on assessments of application knowledge. This study contributes to the literature by highlighting the importance of utility value and expectancy interventions through the use of digital mathematics curricula.

(De)motivating teaching styles in higher education – validation of the circumplex model
Keywords: Higher Education, Motivation, Self-determination, Teaching Approaches
Presenting Author: Aleksandra Huic, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia; **Co-Author:**Nina Pavlin-Bernardic, Faculty of Humanities and Social Sciences, Croatia; **Co-Author:**Vesna Vlahovic-Stetic, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia

A new circumplex model of teacher (de)motivating styles (Aelterman et al., 2019) distinguishes not only between autonomy supportive and controlling behaviors which lead to basic need support/thwarting in students, but between the level of direction in teaching/learning. The latter are described by two new styles - structure and chaos. However, investigations of this new model are still rare, especially in the context of higher education. This study extends previous literature by validating the Croatian translation of the Situation-in-Schools Questionnaire – Higher education (SIS-HE) which operationalizes the above model. We conducted two studies. In the first, qualitative, study, 2 focus groups were conducted with a total of 17 university teachers with the goal of translation and adaptation of the questionnaire. In the second, quantitative study, 130 university teachers participated in an online survey and filled out the Croatian version of the SIS-HE Questionnaire, the Psychologically Controlling Teaching Questionnaire, part of the Teacher as a Social Context Questionnaire and the Approaches to Teaching Questionnaire. Findings from the qualitative study suggest situational vignettes on which the SIS-HE is based are suitable for the Croatian higher education context and have adequate face validity and clarity. Results of the quantitative study confirm the expected internal structure, as well as the convergent and discriminant validity of the questionnaire. Multidimensional scaling analysis confirmed the assumed circularity of the model. Findings have both theoretical and practical implications.

Using a Person-Centered Approach to Study Motivating and Demotivating Teaching Styles
Keywords: Engagement, Higher Education, Motivation, Self-determination
Presenting Author: Lennia Matos, Pontifical Catholic University of Peru, Peru; **Co-Author:**Rafael Gargurevich, Pontificia Universidad Católica del Perú, Peru; **Co-Author:**Dora Herrera, Pontificia Universidad Católica del Perú, Peru; **Co-Author:**Mordechai Benita, Ben-Gurion University of the Negev, Israel; **Co-Author:**Johnmarshall Reeve, Australian Catholic University, Australia

According to Self-determination theory, students' basic psychological needs (autonomy, competence, and relatedness) are essential for wellbeing, engagement, and optimal development and functioning. Social contexts can promote or thwart these needs. In order to analyze group difference effects on students' need-satisfaction, need-frustration, engagement, and disengagement, a person-centered approach (cluster analysis) was used to generate combinations of perceived motivating (autonomy-support/structure) and demotivating (control/chaos) teaching styles. The sample was composed by 420 university students from Peru. The best fit of the data was a four-cluster solution. The supportive-style was related to only positive outcomes while the thwartive-style was related to the negative ones. The demanding-style and the neglectful-style were related to moderate or low levels of positive and negative outcomes. These findings show the predictive power of each distinct perceived teaching style.

Session D 23

23 August 2023 08:00 - 09:30
UOM_R02
Poster Presentation
Cognitive Science, Learning and Instructional Technology, Teaching and Teacher Education

The Use of Eye Tracking in Studying Cognition and Learning

Keywords: Artificial Intelligence, At-risk Students, Classroom Management, Comprehension of Text and Graphics, Computer-assisted Learning, Conceptual Change, E-learning/ Online Learning, Eye Tracking, Game-based Learning, Learning Analytics, Learning Strategies, Misconceptions, Mixed-method Research, Multimedia Learning, Science and STEM, Teacher Professional Development, Video-based Learning
Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 03 - Conceptual Change, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 27 - Online Measures of Learning Processes
Chairperson: Dimitrios Stamovlasis, Aristotle University of Thessaloniki, Greece

Finding the balance: Can generating predictions promote conceptual change in intuitive physics?
Keywords: Conceptual Change, Eye Tracking, Learning Strategies, Misconceptions
Presenting Author: Elfriede Diestel, DIPF Frankfurt, Germany; **Co-Author:**Maria Theobald, DIPF Frankfurt, Germany; **Co-Author:**Garvin Brod, DIPF Frankfurt, Germany

Generating (incorrect) predictions before seeing the correct outcome is hypothesized to facilitate the revision of misconceptions because it induces a meaningful

cognitive conflict in learners. In line with this hypothesis, Theobald and Brod (2021) found that incorrect predictions evoked surprise, which was associated with successful revision of a misconception about water displacement. The aim of this study, which will be performed in 2023, is to replicate and extend these findings using a more complex task. Here, children between the ages of six and eleven learn about torque via a balance scale task (Siegler, 1976). While water displacement depends on only one factor (the object's size), in the balance task, two factors (weight and distance) determine in which direction the scale tips or balances. The study follows a between-subject pretest-learning phase-posttest-transfer test design. In a computerized task, children see a balance scale (fulcrum with an arm that can rotate around it) with varying amounts of weights (1–4) placed at varying distances from the fulcrum (1–4). In some of the trials, the common misconception (only weight determines balance) leads to the correct solution while in the other trials, the misconception leads to the incorrect solution. Children state their expectations about which side of the scale goes down (left/right) or whether the scale stays balanced either before seeing the correct answer (prediction condition) or after (postdictioncondition). We hypothesize that generating predictions facilitates conceptual change in children even during a more complex task.

Using eye-tracking measures to predict novice learners' Python program reading performance
Keywords: Eye Tracking, Learning Analytics, Mixed-method Research, Science and STEM
Presenting Author: Meng-Jung Tsai, National Taiwan Normal University, Taiwan; **Co-Author:**Dai-Rung Li, National Taiwan Normal University, Taiwan; **Co-Author:**Po-Fen Hsu, National Taiwan Normal University, Taiwan; **Co-Author:**Chung-Yuan Hsu, National Pingtung University of Science and Technology, Taiwan; **Co-Author:**Guo-Li Chiou, National Taiwan Normal University, Taiwan

This study explored novice learners' information processing in Python program reading. 60 university novice programming learners served as the sample of this study. Tobii 4C, RealGaze 2.0 and WEDA 2.0 were used to track and analyze each participant's eye movement collected in a Python reading test. A post-task interview was also conducted to understand the difficulties faced during the reading. We conducted data analyses in several stages. First, eye-tracking indices, scan paths and heat maps were observed for each participant. Second, logistic regression analyses were performed to examine the models using eye-tracking measures to predict reading performances. Finally, independent *t* tests, scan paths and lag sequential analyses (LSA) were conducted to examine and profile the visual attention patterns for the correct- and incorrect-response groups. The results indicated that students' reading performance can be significantly predicted by eye-tracking measures in each reading task, with a prediction rate above 0.6 for correct-response predictions and ranged from 0.8 to 0.9 for incorrect-response predictions. It is worth noting that saccadic measures were included in all models. Specifically, participants with longer saccadic length in critical-relevant areas and shorter saccadic length in irrelevant areas were more likely to respond incorrectly in the reading tasks. Additionally, the correct-response group paid more attention on variables than the incorrect-response group. Different visual behavior characteristics were revealed for both groups. These results imply that novice learners may have difficulties in tracking values of variables and identifying critical elements in Python programs. The difficulties are reconfirmed by the interview data.

Using gaze-cued think-aloud to elicit teachers' professional vision of classroom management
Keywords: Classroom Management, Eye Tracking, Teacher Professional Development, Video-based Learning
Presenting Author: Rebekka Stahnke, Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Sigrid Blomeke, University of Oslo, Norway

Professional vision of classroom management is an important aspect of teacher expertise and describes their ability to notice relevant events, interpret these events and decide on possible next strategies. Learning more about the cognitive processes of expert and novice teachers could help to develop ways for fostering teacher professional vision. However, accessing teachers' cognition while they use these abilities can be methodologically challenging. One promising approach is eliciting and analyzing think-aloud data.We used a gaze-cued think-aloud method to compare nineteen novice and twenty expert teachers' professional vision of classroom management (displayed in video clips). Think-aloud data was transcribed and coded with regard to events noticed, processes display as well as the content of analysis. Results revealed characteristics of expertise both in terms of the frequencies of noticed events or suggested courses of action and patterns of event analysis: experts noticed more events than novices, they also talked more about student learning and the teachers monitoring. Their analysis of events showed a higher proportion of idea units addressing how the teachers' behavior or the context can be adapted appropriately. The think-aloud method used enabled us to gain insights into teachers' professional vision. It supported teachers in expressing their comprehensive thoughts. However, the unlimited time as well as the retrospective report might entail some disadvantages as teachers may express thoughts that did only occur to them during a second watching of the video clips. Despite these limitations, think-aloud methods can facilitate insights into teachers' cognitive processes while observing classroom management events.

The role of prior knowledge in playing a game incorporating self-explanation: An eye-tracking study
Keywords: Computer-assisted Learning, E-learning/ Online Learning, Eye Tracking, Game-based Learning
Presenting Author: Guo-Li Chiou, National Taiwan Normal University, Taiwan; **Co-Author:**Chung-Yuan Hsu, National Pingtung University of Science and Technology, Taiwan; **Co-Author:**Meng-Jung Tsai, National Taiwan Normal University, Taiwan

The purpose of this study was to explore how students interacted with self-explanation prompts in a computer game that was designed to enhance their conceptual understanding by using eye-tracking techniques. This study adopted a pretest-posttest design, and the participants (43 fourth graders) were randomly assigned to either the experimental or the control group. While the experimental group played the game with self-explanation prompts, the control group played the version without self-explanation. An eye tracker was used to record both groups' eye movements while playing the games. The results indicate that engaging in self-explanation had a significantly positive effect on the posttest score only for the participants with the lower pretest score. Moreover, for the experimental group, the results of eye-movement analyses show that the participants with the higher level of pretest score made more visual transitions between the self-explanation prompts and relevant game components. In other words, how the participants reacted to the self-explanation prompts varied with their prior knowledge. Game designers are suggested to address this issue when incorporating instructional features into a computer game.

How to signal animations for learners with different prior knowledge levels: an eye-tracking study
Keywords: Comprehension of Text and Graphics, Eye Tracking, Multimedia Learning, Video-based Learning
Presenting Author: Killyam Forge, University of Toulouse, CLLE, France; **Co-Author:**Julie Lemarié, University of Toulouse, CLLE, France; **Co-Author:**Jean-Michel Boucheix, University of Dijon, LEAD-CNRS, France; **Co-Author:**Pierre-Vincent Paubel, University of Toulouse, CLLE, France

The inconsistent results in the scientific literature on the signaling effect in learning from educational animations makes necessary a better understanding of the boundary conditions of signaling effectiveness. Some moderators of the signaling effect are related to the characteristics of the learner (e.g., level of prior knowledge) and some concern the signals' properties (e.g., quantity, accessibility, relevance). This eye-tracking study aims to investigate the joint effects of prior knowledge and the signal's level of accessibility on learning performance (comprehension, inference and transfer) and cognitive load of learners studying from an entirely visual animation about the piano mechanism (Boucheix & Lowe, 2010). The results will improve our understanding of the conditions of effectiveness of the signaling effect in learning from dynamic content, in order to provide recommendations to teachers and instructional designers on how to facilitate student learning by effectively incorporating signals into their instructional animations.

Using AI in educational apps to individually support students: Opportunities and challenges
Keywords: Artificial Intelligence, At-risk Students, Computer-assisted Learning, Eye Tracking
Presenting Author: Maike Schindler, Universität zu Köln/ University of Cologne, Germany; **Presenting Author:**Achim J. Lilienthal, TU Munich, Germany

In this theoretical paper, we elaborate on the potential of using Artificial Intelligence (AI) for smart educational apps that can identify student strategies and their individual needs of support, and support students individually and adaptively in their learning. To illustrate this, we will present different projects in mathematics education where AI is being used, partially in combination with eye tracking, in order to identify student needs and to support them. We illustrate how the use of AI in educational apps can have an added value in school practice, especially when resources such as teachers' time to support students are limited. Here, AI can help identifying student strategies, their strengths and needs of support and help providing adaptive and individual support. We will elaborate on the opportunities and the shortcomings of AI, and about possibilities to deal with challenges in the development and use of smart educational apps.

Session D 24

23 August 2023 08:00 - 09:30
UOM_R03
Poster Presentation
Assessment and Evaluation, Educational Policy and Systems, Lifelong Learning, Motivational, Social and Affective Processes, Teaching and Teacher Education

Sustainable Development and Education

Keywords: Achievement, Assessment Methods, Attitudes and Beliefs, Cognitive Skills and Processes, Cooperative/Collaborative Learning, Curriculum Development, Early Childhood Education, Educational Attainment, Educational Policy, Environmental Education, Higher Education, In-service Teachers, Pre-service Teachers, Qualitative Methods, Reading, School Effectiveness, Sustainable Development, Writing/Literacy
Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development, SIG 18 - Educational Effectiveness and Improvement, SIG 28 - Play, Learning and Development
Chairperson: Lorenzo Miani, Italy

Quality Teacher Education in the context of the Sustainable Development Goals
Keywords: Higher Education, Pre-service Teachers, Qualitative Methods, Sustainable Development
Presenting Author: Sunet Grobler, University of Innsbruck - Institute for Teacher Education and School Research, Austria

In 2015, the United Nations (UN) developed the 17 Sustainable Development Goals (SDGs) with a focus on the people, planet, prosperity, peace and partnership (UN, 2015; UNESCAP, 2019). The fourth SDG is labelled as *quality education,* and with this goal, the UN aims to *"ensure inclusive and equitable quality education and promote lifelong learning opportunities for all"* (UN, 2015, p. 19). SDG4, as *quality education,* lays the foundation for cultivating a sense of sustainability in pre-service teachers since education contributes significantly to reaching the SDGs (Nazar et al., 2018; Thangeda et al., 2016). However, there is ambiguity in the meanings of the involved concepts. This study explores the quantitative and qualitative margins of SDG4 since it significantly transforms education for sustainability (Ferrer-Estévez & Chalmeta, 2021; UNESCO, 2017). Therefore, a systematic qualitative investigation was executed to gain global interpretations of the concepts such as *quality education* and *sustainability*. Investigation into how SDG4 is promoted in different contexts also transpired. Reflecting on the data from policy documents, stakeholder interviews and focus groups during an SDG4 webinar, this paper introduces emerging themes. The holistic context approach is necessary for a sustainable future while focusing on aspects such as the self, people´s needs, values, and balance between values, aspirations and reality. It also shows the importance of education quality (or effectiveness) for sustainability. By integrating intermediate theories, this study suggests ways in which teacher education and the promotion of SDGs can cultivate a sense of sustainability in pre-service teachers beyond the level of qualification.

Development of young children in China: Comparing parent report and direct assessment longitudinally
Keywords: Assessment Methods, Early Childhood Education, Educational Policy, Sustainable Development
Presenting Author: Zeyi Li, The University of Hong Kong, Hong Kong; **Co-Author:**Stephanie Wing Yan Chan, The University of Hong Kong, Hong Kong; **Co-Author:**Nirmala Rao, The University of Hong Kong, Hong Kong

Sustainable Development Goal (SDG) Target 4.2 states that by 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education. Progress towards the target is evaluated using two indicators. SDG Target Indicator 4.2.1 measures the “proportion of children aged 24 to 59 months who are developmentally on track in Health, Learning, and Psychosocial well-being.” SDG Target Indicator 4.2.2 focuses on the “participation rate in organized learning.” A parent report measure, ECDI2030, was developed by UNICEF to determine children’s “developmentally on track” status and measure progress towards SDG Target 4.2.1. Earlier studies compared results from ECDI2030 with those from a corresponding direct assessment measure, the Early Childhood Development Assessment Scale (ECDAS) and found a moderate- to high- correlation, and similar factor structure between the two measures. This study further examined the stability of correlations between ECDI2030 and ECDAS using a longitudinal design. Participants were three- to six-year-olds in Beijing and Hebei Province, China, and their parents. Children’s development was assessed by ECDAS on two occasions, 12 months apart, and parents completed the ECDI2030 concurrently. Results from both measures were associated with child age, gender, urbanicity, and socio-economic status. However, parent report results showed less variability and discrimination of developmental competencies than direct assessment, and this pattern was exacerbated as children matured. Both measures indicated different rates of development across the three domains. Factors contributing to associations between parent reports and direct assessment are discussed.

Local and Regional Influences When Developing K-12 Climate Change Education Policy
Keywords: Educational Policy, Environmental Education, Qualitative Methods, Sustainable Development
Presenting Author: Laurel Kruke, University of Southern California, United States; **Co-Author:**Gale Sinatra, University of Southern California, United States; **Co-Author:**Julie Marsh, University of Southern California, United States

Environmental and climate change education is inconsistently integrated into classrooms around the world, with some countries incorporating it into national education standards, and others leaving the decisions up to individual districts. These national or regional conversations often begin because of natural disasters or other public discourse about current or future quality of life for a country’s citizens. This poster presentation showcases Los Angeles Unified School District’s Climate Literacy resolution as an example of a policy passed at a local level to show support for climate change education efforts in the second largest school district in the United States. Through a qualitative analysis of semi-structured interviews with key contributors to the development and adoption process, this study shows that local climate change impacts influenced the timing and positive reception this policy received. Findings also indicate there is still confusion, even from supportive leadership, about the definition of climate literacy as a subject. More education around the definition of climate literacy, an emphasis on broad policy efforts (in addition to individual actions), and crafting rhetoric around local and regional climate change impacts can improve the uptake of climate change education in education systems.

Curriculum, transfer, equity. What research can(‘t) tell us.
Keywords: Cognitive Skills and Processes, Curriculum Development, Educational Attainment, School Effectiveness
Presenting Author: Daniel Muijs, Queen's University Belfast, United Kingdom

While traditionally much of the focus in teacher effectiveness research has been on process (how do we teach), there has recently been increasing interest in the content (what do we teach). In particular, the concept of a knowledge rich curriculum has been touted as a solution for a number of equity issues in education. In this paper we will explore whether claims in favour of a knowledge curriculum and even for particular content are actually supported by evidence from educational effectiveness research, programme evaluations and cognitive science. A systematic review methodology was used to interrogate the literature in this area. A systematic review methodology was used to interrogate the literature in this area. Findings suggest that while evidence provides arguments for the structure of curriculum and the importance of knowledge, they do not, as sometimes stated, provide any justification for the actual content of that curriculum.

The cultural correlates of learning poverty: An ecological analysis across 45 countries Long-term
Keywords: Achievement, Attitudes and Beliefs, Reading, Writing/Literacy
Presenting Author: Ronnel Bornasal King, The Chinese University of Hong Kong, Hong Kong; **Co-Author:**Jiajing Li, The University of Macau, Macao; **Co-Author:**Shing On Leung, The University of Macau, Macao

Learning poverty is a critical social problem that has drawn considerable attention in recent years. However, past studies on learning poverty have mostly focused on the role of economic factors. Few studies have explored how cultural values are associated with learning poverty. To address this gap, we examined whether national cultural values (i.e., power distance, individualism, masculinity, uncertainty avoidance, long-term orientation, and indulgence) were associated with learning poverty in 45 countries after accounting for the roles of economic factors, gender, and duration of compulsory education. Results indicated that out of the six cultural values, long-term orientation was negatively associated with learning poverty but power distance was positively associated with it. The

findings of this study extend the literature on learning poverty by emphasizing the cultural correlates of learning poverty.

How do all these big concepts of a sustainable planet have the power to change my practice?
Keywords: Cooperative/Collaborative Learning, Early Childhood Education, Environmental Education, In-service Teachers
Presenting Author: Torhild Høydalsvik, Volda University College, Norway; **Co-Author:**Jan Vikane, Volda University College, Norway

Education for Sustainability is motivated by a need for an education that empowers children of all ages with knowledge, skills, values, and attitudes to address the global challenges we are facing (Chen & Liu, 2020). We are interested in how the teachers work with these challenges as their professional development. Our title 'How do all these big concepts of a sustainable planet have the power to change my practice'? It is a sigh og heart from a person who have found it best to do it small and simple in her early childhood education´s teacher practice. Powerlessness and despair are easy to fall into when the United Nation´s goals are made of big concepts, difficult to translate to daily life.We have collected data from 26 part-time students combining practising as teachers in early childhood education (ECE) in Norway. We chose a mixed methods design with three different data set, first as descriptive statistics, and other data by qualitative research analysis method: Stepwise-Deductive Induction (Tjora, 2018) developing concepts and models and reduce complexity. We found that the capacity to educate for sustainable development must be strengthened by developing teachers' expertise and awareness about professional development for teachers in service. Further we found a weak connection between the expressed the concept sustainable development and the teachers´ didactic developmental projects´ content for the children. We are working on how to tie together a higher motivation with focus on the teachers´ opportunities by strengthen their practical action competence.

Session D 25

23 August 2023 08:00 - 09:30
UOM_GYM
Roundtable
Higher Education, Learning and Social Interaction, Teaching and Teacher Education

Citizenship Education and Argumentation

Keywords: Argumentation, Attitudes and Beliefs, Citizenship Education, Critical Thinking, Higher Education, In-service Teachers, Inclusive Education, Mixed-method Research, Primary Education, Reasoning, Researcher Education, Secondary Education, Teacher Professional Development
Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 13 - Moral and Democratic Education, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Bruno Poellhuber, University of Montreal, Canada

Disagreement as a value in education for democracy: Patterns of classroom talk and teacher beliefs
Keywords: Attitudes and Beliefs, Citizenship Education, In-service Teachers, Primary Education
Presenting Author: Andreas Reichelt Lind, OsloMet - Oslo Metropolitan University, Norway

This roundtable presentation explores the different ways that disagreement is valued by primary school teachers in Norwegian primary school classrooms. The emergent patterns will be discussed in relation to the goal of educating for democracy. The study builds on transcriptions of recorded sequences from classroom lessons where disagreement is made a topic by the teachers, as well as interviews of teachers where the role of disagreement for critical thinking was thematized. Preliminary results indicate that the teachers attribute extrinsic value to disagreement. In the classroom talk, however, it tends to be unclear for what purpose or which intrinsic value(s). When group tasks are presented, on the other hand, they tend to be oriented towards reaching consensus. It is the valuation of disagreement in relation to education for democracy, as well as the discrepancy between valuing disagreement but aiming for consensus in practice, I want to address during this roundtable discussion.

Culture of Democracy in the Changing Landscape of Higher Education in the USA
Keywords: Citizenship Education, Critical Thinking, Higher Education, Inclusive Education
Presenting Author: Sandra Bass, UC Berkeley, United States; **Presenting Author:**Thomas Schnaubelt, Stanford University, United States; **Presenting Author:**Anna Mahoney, Tulane University, United States; **Presenting Author:**Agnieszka Nance, Tulane University, United States; **Presenting Author:**Ryan McBride, Tulane University, United States

In the changing landscape of American higher education, universities and colleges are struggling to articulate the importance of civic education and to implement practices contributing to the development of a civic identity. A fundamental responsibility of higher education is now in question as universities look to revive civic education and initiate new programs to re-establish their role in supporting democracy. This proposed (workshop/roundtable) will focus on several research-based approaches from different institutions in the USA, rooted in a shared desire for educating for effective citizenry. For the purpose of this presentation, we will focus on our shared framework for the development of a healthy civic identity, comprised of the following commitments: Commitment to the Values, Practices and Institutions of Liberal Democracy; Focused Commitment(s) to an Issue(s), Commitment to Integrity; Communitarian Mindset and five building blocks: Capacity to Engage Constructively Across Difference; Democratic Knowledge, Habits, and Skills; Knowledge of Social Change Frameworks and Tools, Deep Content Knowledge, and Resilient Mind, Body and Spirit. The presenters will share their programmatic initiatives on individual campuses with particular attention to efforts where student outcomes in these areas have been rigorously assessed in ways that can be replicated. Scholars will share work related to an individual core commitment or building block, or contributions that interrogate the relationship between two or more dimensions.

School at the museum: non formal education and teachers' professional development
Keywords: Citizenship Education, Mixed-method Research, Researcher Education, Teacher Professional Development
Presenting Author: Laura Landi, Università di Modena e Reggio Emilia, Italy; **Co-Author:**Chiara Bertolini, Università degli studi di Modena e Reggio Emilia - Department of Education adn Human Sciences, Italy; **Co-Author:**Lucia Scipione, University of Modena and Reggio Emilia, Italy; **Co-Author:**Chiara Pelliciari, Musei civici di Reggio Emilia, Italy; **Co-Author:**Riccardo Campanini, Musei civici di Reggio Emilia, Italy; **Co-Author:**Alessandra Landini, Istituto Comprensivo Manzoni, Italy; **Co-Author:**Agnese Vezzani, University of Modena and Reggio Emilia - Department of Education and Human Sciences, Italy; **Co-Author:**Mariangela Scarpini, Unimore (University of Modena and Reggio Emilia), Italy

The pandemic and the sudden need for spacing has forced institutions to react creatively and plan new ways for distance learning. In Reggio Emilia all primary and middle schools of one educational institution took turns in spending a week at the local museum. This unexpected encounter between formal and non-formal education provided fertile ground for creating new awareness, innovating teaching methodologies and researching professional development possibilities. To exploit this opportunity the school and the museum involved university researchers. This experience was transformed from an emergency measure into an educational opportunity: for the students, who were able to learn in an immersive environment with a dynamic, inclusive and interdisciplinary approach; for the teachers, who designed and delivered lessons together with the museum staff, and for the museum educators, who rethought their educational offer. The CERIID (UNIMORE) research group has observed, monitored and described the educational offer of the Museum. It has collected data on all three actors involved. The experience has proved particularly useful as a venue for teachers' professional development. Data were collected through observation, and focus group. We intend to present our results in terms of changes in beliefs, teaching methodologies, observational abilities and awareness of students' competencies. We aim at opening a dialogue to investigate the possibility of mutuating educational format from non-formal education to foster teachers' reflexive processes based on cultural transposition (Mellone, 2018).

The interplay between task characteristics and quality of student dialogue in citizenship education
Keywords: Argumentation, Citizenship Education, Reasoning, Secondary Education
Presenting Author: Monika Waldis, University of Applied Sciences Northwestern Switzerland, Switzerland; **Co-Author:**Manuel Hubacher, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland; **Co-Author:**Liliane Wenger, University of Applied Sciences and Arts Northwestern Switzerland

FHNW, Switzerland; **Co-Author:**Acelya Aydin, University of Applied Sciences and Arts Northwestern Switzerland FHNW, Switzerland

An important component of contemporary citizenship is the ability to form one's own opinion about matters concerning justice and the public interest. This includes the ability to process multiple information, acknowledge own and others' needs and interests, and to draw factual and value-related decisions. According to literature, stimulating dialogue in classroom teaching may foster student's ability to argue about factual and value-related matters. Moderate controversial topics and an argumentation strategy training contribute to enhance the quality of student dialogue in citizenship education. This study investigates how task characteristics intervene with the quality of student dialogue in citizenship education. Coding instruments such as the discourse quality index (Steenbergen et al. 2003) and a grid investigating transactivity (Gronostay, 2019) prove to be of diagnostic relevance for student's civic reasoning ability. The interplay between task settings and prompts (e.g. controversy, complexity, different perspectives and value-based references) and its specific links to the discourse quality of classroom debates will be further elaborated and discussed.

Session D 26

23 August 2023 08:00 - 09:30
UOM_A13
Workshop
Teaching and Teacher Education

Portrait methodology: a valuable tool to stimulate teacher identity reflection and development

Keywords: Mentoring and Coaching, Qualitative Methods, Self-concept, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education

Join this workshop if you are interested in a very effective, non-traditional, and dialogic way to encourage teachers to reflect on their teaching experiences and to explore teacher identity development. I will present the findings of and reflections on a completed doctoral research carried out on four novice English teachers and the development of their sense of teacher identity throughout their first year of teaching, whilst engaging in *portrait methodology.* Portrait methodology is a qualitative and narrative research method that sets out to explore the realities of participants' perspectives on their lived experiences through in-depth interviews and aims to capture the essence of these perspectives and experiences in a written portrait, which is consequently used as a reflection tool. It is among the emerging narrative approaches to promote creative ways to trigger deep reflection and stimulate identity development with professionals. In this workshop I will share my research journey as a portrait methodologist: from my rationale for using this approach to the implications of conducting portrait methodology. I will interactively discuss with you the dilemmatic moments during the research process and which methodological choice would fit this approach most. This interactive session will vary in work forms, from sharing the theory behind portrait methodology to active engagement and reflective discussion on conducting this approach. This all with the intention to increase your understanding of how portrait methodology contributes to teacher identity reflection and development.

Portrait methodology: a valuable tool to stimulate teacher identity reflection and development
Presenting Author: Ella AIT-ZAOUIT, Fontys University of Applied Sciences, Netherlands

Join this workshop if you are interested in a very effective, non-traditional, and dialogic way to encourage teachers to reflect on their teaching experiences and to explore teacher identity development. I will present the findings of and reflections on a completed doctoral research carried out on four novice English teachers and the development of their sense of teacher identity throughout their first year of teaching, whilst engaging in *portrait methodology.* Portrait methodology is a qualitative and narrative research method that sets out to explore the realities of participants' perspectives on their lived experiences through in-depth interviews and aims to capture the essence of these perspectives and experiences in a written portrait, which is consequently used as a reflection tool. It is among the emerging narrative approaches to promote creative ways to trigger deep reflection and stimulate identity development with professionals. In this workshop I will share my research journey as a portrait methodologist: from my rationale for using this approach to the implications of conducting portrait methodology. I will interactively discuss with you the dilemmatic moments during the research process and which methodological choice would fit this approach most. This interactive session will vary in work forms, from sharing the theory behind portrait methodology to active engagement and reflective discussion on conducting this approach. This all with the intention to increase your understanding of how portrait methodology contributes to teacher identity reflection and development.

Session D 27

23 August 2023 08:00 - 09:30
UOM_A07
ICT Demonstration
Learning and Instructional Technology

A new tool for exploring scientific work and writing in the face of Digitization

Keywords: Critical Thinking, Digital Literacy and Learning, Tool Development, Writing/Literacy
Interest group: SIG 12 - Writing

Please bring your own device if you are attending this ICT demonstration.There is a mushrooming of tools that support almost all aspects of scientific thinking and writing. Tasks such as writing, thinking, communicating, planning, project management, organizing, researching, text evaluation, reading, and summarizing are increasingly supported digitally and intertwined. As such, computers become essentially co-authors of academic texts. Furthermore, advances in computer science and computer linguistics make these tools knowledgeable of aspects such as language and, more recently, content. However, rarely are these tools known to instructors or students, or openly accessible. Additionally, it is difficult to keep track of not only ongoing developments but also the disappearance of respective tools. This also poses challenges to both the usage of such tools and how to teach their use. In response, we have created an openly accessible platform that facilitates the testing and teaching of a selection of such tools. In this presentation we will demonstrate a prototype of the platform, explain its rationale and intended pedagogy.

A new tool for exploring scientific work and writing in the face of Digitization
Presenting Author: Jakob Ott, ZHAW Zurich University of Applied Sciences, Switzerland; **Co-Author:**Christian Rapp, ZHAW School of Management and Law, Switzerland; **Co-Author:**Otto Kruse, Zurich University of Applied Sciences (ZHAW), Switzerland; **Co-Author:**CURTIS GAUTSCHI, Zurich University of Applied Sciences (ZHAW), Switzerland

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Keynotes 1

23 August 2023 09:45 - 11:15
AUTH_CH
Keynote

Numbers, Brains, Development and Education: Progress, Challenges and Promise

Keywords: Cognitive Development, Early Childhood Education, Educational Neuroscience, Mathematics/Numeracy
Interest group:
Chairperson: Eleni Kyza, Cyprus University of Technology, Cyprus

In recent years, cognitive, developmental, and educational psychologists have made great strides towards a better understanding of how children develop numerical and mathematical skills and understanding from an early age onwards. In addition, cognitive neuroscientists have used a variety of non-invasive neuroimaging tools to better understand the neural correlates of the development of numerical and mathematical skills. In this talk I will review these contributions to our understanding of children's developing numerical and mathematical abilities and understanding. I will discuss what we have learnt about the foundations underlying numerical and mathematical abilities. I will focus on how children's developing understanding of numerical symbols (e.g., number words and Arabic numerals) serves as a critical foundation for later mathematical abilities and how the learning of numerical symbols shapes the developing brain. Furthermore, I will consider not only how this recent can be applied to educational contexts but als what we learn from those contexts can inform behavioral and brain-imaging research on the development of mathematical cognition. Relatedly, I will consider barriers to successful translation of research and the dialog between research and educational practice. Finally, I will discuss the importance of taking an inclusive, global approach to research into children's development of numerical and mathematical skills that goes beyond the study of White Educated Industrialized, Rich, and Democratic (WEIRD) populations.

Numbers, Brains, Development and Education: Progress, Challenges and Promise
Presenting Author: Daniel Ansari, University of Western Ontario, Canada

In recent years, cognitive, developmental, and educational psychologists have made great strides towards a better understanding of how children develop numerical and mathematical skills and understanding from an early age onwards. In addition, cognitive neuroscientists have used a variety of non-invasive neuroimaging tools to better understand the neural correlates of the development of numerical and mathematical skills. In this talk I will review these contributions to our understanding of children's developing numerical and mathematical abilities and understanding. I will discuss what we have learnt about the foundations underlying numerical and mathematical abilities. I will focus on how children's developing understanding of numerical symbols (e.g., number words and Arabic numerals) serves as a critical foundation for later mathematical abilities and how the learning of numerical symbols shapes the developing brain. Furthermore, I will consider not only how this recent can be applied to educational contexts but als what we learn from those contexts can inform behavioral and brain-imaging research on the development of mathematical cognition. Relatedly, I will consider barriers to successful translation of research and the dialog between research and educational practice. Finally, I will discuss the importance of taking an inclusive, global approach to research into children's development of numerical and mathematical skills that goes beyond the study of White Educated Industrialized, Rich, and Democratic (WEIRD) populations.

Keynotes 2

23 August 2023 09:45 - 11:15
HELEXPO_CC
Keynote
Higher Education

Together for learning: Understanding the ecosystem of collaborative learning

Keywords: Cooperative/Collaborative Learning, Higher Education, Learning Analytics, Problem Solving
Interest group: SIG 04 - Higher Education
Chairperson: Armin Weinberger, Saarland University, Germany

More than ever before, collaboration and dialogue have become means to address major challenges we are currently facing - pandemic, conflict, humanitarian crises. At the macro societal level but also at the micro-level of workplaces and classrooms, knowing how to collaborate and how to solve problems together is paramount. Yet, while the value of working and learning together with others is widely acknowledged, meaningful and productive collaboration remains difficult to accomplish, gauge and guide.In this keynote, I will reflect on the complexity of the collaborative learning process and what it implies for researching these processes from an ecological perspective using new analytics techniques.Outcomes of collaborative learning have been examined extensively through scaled assessments and sociocultural studies continue to reveal new knowledge about the dialogical nature of collaborative learning. Yet remaining are questions about how individual cognitions are joined into productive interaction, how collaboration dynamics are shaped or what drives collaboration when difficulties occur.Against this backdrop, and taking departure in empirical research on small group collaboration in higher education contexts, I will discuss (i) the need for examining the collaborative process as an interrelated set of actions, people and resources – the ecosystem of collaborative learning, (ii) individual and collective factors salient to collaborative learning, and (iii) the multimodal nature of in-situ collaboration. Further, I will elaborate on how digital technologies and data-based analytic techniques offer new opportunities to examine some of the 'black-boxed' aspects of collaborative learning.This presentation will also consider the challenges of researching collaborative learning processes. First, I will address methodological challenges, primarily focusing on the pitfalls of reductionistic interpretation and the need for methodological triangulation. Second, I discuss a combined empirical and conceptual challenge; as digital traces of collaboration are disclosed through new digital technologies and analytical techniques, the question of what constitutes collaboration becomes highly relevant. I will conclude by exploring the implications of examining the ecosystem of collaborative learning for how we are framing education to prepare a young generation to jointly engage with present and future hardships.

Together for learning: Understanding the ecosystem of collaborative learning
Presenting Author: Crina Damsa, University of Oslo, Norway

More than ever before, collaboration and dialogue have become means to address major challenges we are currently facing - pandemic, conflict, humanitarian crises. At the macro societal level but also at the micro-level of workplaces and classrooms, knowing how to collaborate and how to solve problems together is paramount. Yet, while the value of working and learning together with others is widely acknowledged, meaningful and productive collaboration remains difficult to accomplish, gauge and guide.In this keynote, I will reflect on the complexity of the collaborative learning process and what it implies for researching these processes from an ecological perspective using new analytics techniques.Outcomes of collaborative learning have been examined extensively through scaled assessments and sociocultural studies continue to reveal new knowledge about the dialogical nature of collaborative learning. Yet remaining are questions about how individual cognitions are joined into productive interaction, how collaboration dynamics are shaped or what drives collaboration when difficulties occur.Against this backdrop, and taking departure in empirical research on small group collaboration in higher education contexts, I will discuss (i) the need for examining the collaborative process as an interrelated set of actions, people and resources – the ecosystem of collaborative learning, (ii) individual and collective factors salient to collaborative learning, and (iii) the multimodal nature of in-situ collaboration. Further, I will elaborate on how digital technologies and data-based analytic techniques offer new opportunities to examine some of the 'black-boxed' aspects of collaborative learning.This presentation will also consider the challenges of researching collaborative learning processes. First, I will address methodological challenges, primarily focusing on the pitfalls of reductionistic interpretation and the need for methodological triangulation. Second, I discuss a combined empirical and conceptual challenge; as digital traces of collaboration are disclosed through new digital technologies and analytical techniques, the question of what constitutes collaboration becomes highly relevant. I will conclude by exploring the implications of examining the ecosystem of collaborative learning for how we are framing education to prepare a young generation to jointly engage with present and future hardships.

Keynotes 3

23 August 2023 09:45 - 11:15
UOM_CH
Keynote

Learning to Master Writing: Coping with the Cognitive Demands of Writing Processes

Keywords: Cognitive Development, Cognitive Skills and Processes, Self-regulated Learning and Behaviour, Writing/Literacy
Interest group: SIG 12 - Writing
Chairperson: Rui Alexandre Alves, University of Porto, Portugal

Writing, as a component of literacy, offers possibilities for independent personal development. It allows individuals to acquire knowledge and culture, and corollary to better comprehend the surrounding world and therefore to emancipate from instrumented ideology (Nussbaum, 2012). However, mastering writing requires long and explicit instructions. International and national assessments demonstrate that composing texts remains a challenge for students: more than half of primary and secondary students do not meet the expected proficiency levels in writing (Jiménez, 2018). Designing instructions that foster learning to write is therefore essential.Writing instructions that are the more efficient rely on development of self-regulation skills (e.g., Graham et al., 2012). Why are such techniques so efficient? In this keynote, I will adopt a cognitive perspective to explain why efficient management of the writing processes is central for skilled writing.Writing involves many cognitive processes that make heavy demands on working memory. Thus, a common claim in writing research since the 1980s is that writers are cognitively overloaded (Flower & Hayes, 1981). Obviously, this is particularly the case for young students learning to write. However, this also occurs in skilled writers who exhibit high cognitive effort when composing texts. One goal to reach is therefore to minimize the demands that writing places on working memory on the one hand to allow fluent processing (Olive, 2014), and on the second hand for allowing interactions between writing processes in working memory. Such interactions have been shown to be fundamental for efficient and fluent writing (McCutchen, 1988, 2000). In that frame, I will first describe how working memory intervenes during writing. Second, I will address how novice and skilled writers regulate writing processes. Finally, I will describe how executive functions contribute to such regulation (Olive, 2021, 2022; Limpo & Olive, 2021).

Learning to Master Writing: Coping with the Cognitive Demands of Writing Processes
Presenting Author: Thierry Olive, CNRS & Université de Poitiers, France

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Session E 1

23 August 2023 12:00 - 13:30
HELEXPO_CC
Invited Symposium

Current issues in measuring and modeling motivational outcomes international large-scale assessments

Keywords: Achievement, Large-scale Assessment, Motivation, Primary Education, Quantitative Methods, Self-concept, Self-efficacy, Teacher Effectiveness
Interest group:
Chairperson: Ioulia Televantou, European University Cyprus, Cyprus
Organiser: Rolf Strietholt, Germany
Discussant: Christoph Niepel, University of Luxembourg, Luxembourg

The main purpose of international comparative assessments is to measure educational outcomes and compare them within and across countries. This invited symposium focuses on motivational outcomes and uses from the IEA-study (International Association for the Evaluation of Educational Achievement) TIMSS (Trends in International Mathematics and Science Study) data to investigate issues related to the measurement of motivational outcomes and variation in these outcomes. The papers deal with the attitude-achievement paradox, the immigrant paradox, method factors in mixed worded motivational scales, and correlations between various motivational scales. The IEA awards outstanding research papers that use IEA data. Each of the four papers is co-authored by an recent IEA awardee.

Associations between motivation, engaging teaching and math performance in TIMSS 2015
Presenting Author: Michalis Michaelides, University of Cyprus, Cyprus; **Co-Author:**Militsa Ivanova, Department of Psychology, University of Cyprus, Cyprus

Student motivation is a multifaceted construct with empirically supported associations with educational outcomes. The current study used latent variable methodology to examine the factor structure of the engaging teaching and motivational constructs in the fourth- and eighth-grade USA student context questionnaires of the 2015 Trends in International Mathematics and Science Study (TIMSS). Measurement models revealed adequate fit of correlated factors for self-concept, enjoyment, and importance and usefulness of learning mathematics, after controlling for negative wording. Self-concept was the strongest predictor of achievement in both grades; importance and usefulness beliefs had a weak relationship with eighth-grade performance. Engaging teaching and enjoyment were positively associated; accounting for self-concept, the effect of engaging teaching on TIMSS performance was negative and mediated by enjoyment. The results suggest that a multifaceted conceptualization of motivation is needed in studies of student achievement. The strong effect of student self-concept on performance should be acknowledged in educational reforms.

Motivational Outcomes and Immigration Background: Studying the “Immigrant Paradox” using TIMSS
Presenting Author: Ioulia Televantou, European University Cyprus, Cyprus; **Co-Author:**Andrés Christiansen, International Association for the Evaluation of Educational Achievement (IEA), Netherlands; **Co-Author:**Ingrid Gogolin, University of Hamburg, Germany; **Co-Author:**Rolf Strietholt, IEA Hamburg, Germany

Recent immigrant students have better motivational outcomes (e.g., educational aspirations, educational expectations) than native individuals and later immigrants, despite the considerable barriers they face when moving to another country; this trend is commonly referred to as the “immigrant paradox”. Using cross-national data from TIMSS 2019 on grade four students’ self-concept we show that, given the same level of achievement, recent immigrants have higher self-concept than their native peers and later immigrants. This finding remains robust after adjustments for socio-economic status, and, it is detected using data from different educational systems present in the database. However, for some countries, it isn’t shown. Further research is needed before conclusions are reached as to why this paradox may occur.

Exploring the Paradoxical Relation Between Achievement and Self-beliefs: A Country-level Trend Study
Presenting Author: Rolf Strietholt, IEA Hamburg, Germany; **Co-Author:**Mojca Rozman, International Association for the Evaluation of Educational Achievement (IEA), Germany; **Co-Author:**Maximiliano Romero, International Association for the Evaluation of Educational Achievement (IEA), Germany

The positive relationship between the achievement of students and their academic self-concept has been replicated in several studies at student level. At country level, this relationship is negative, and this finding, also repeatedly replicated, is often referred to as the attitude-achievement paradox. A limitation of previous research is that the so-called paradox has only been studied with cross-sectional data. In this study, we investigate the achievement-attitude paradox

with longitudinal trend data from several cycles of TIMSS. The cross-sectionally observed negative correlations vanished in longitudinal analyses. These findings were consistent across grades, subjects, and attitudinal constructs. Our results suggest that the paradox is probably just a spurious correlation due to unobserved time-invariant country-specific characteristics, such as a culture-specific response style.

The method factor in mixed-worded scales: Relationships between scales and with student performance
Presenting Author: Stefan Johansson, University of Gothenburg, Sweden; **Co-Author:**Rolf Strietholt, IEA Hamburg, Germany

Mixed-worded scales require a more careful reading and answering process than scales with only one type of wording. Accordingly, the use of mixed scales is intended to increase data quality. Nevertheless, studies repeatedly find a non-intended method factor for negatively worded items. In the present study, we investigate the relationship between such method factors of different scales and examine whether they are correlated with student performance. Our empirical analysis is based on responses to mixed-worded items on students' self-concepts in math, science, and reading in TIMSS and PIRLS 2011. Using data from 37 countries we observed that a bi-factor models with a general factor for academic self-concept and a nested method factors for the reverse worded items better fit the data than the unidimensional models. The method factors of the measurement models for academic self-concept in reading, math, and science correlate with each other. In further analyses, we found that the method factors are associated with reading performance but not with math and science achievement. This result suggests that reading ability is an important determinant of data quality from surveys in a school context.

Session E 2

23 August 2023 12:00 - 13:30
AUTH_CH
Invited Symposium

Meet the EARLI Editors

Keywords: Higher Education, Qualitative Methods, Quantitative Methods, Writing/Literacy
Interest group:
Chairperson: Rui Alexandre Alves, University of Porto, Portugal
Discussant: Rui Alexandre Alves, University of Porto, Portugal

EARLI publishes three peer-reviewed journals: Learning and Instruction, Educational Research Review and the newest open access journal Frontline Learning Research. Additionally, the EARLI book series, New Perspectives on Learning and Instruction is designed to communicate the high-quality research on learning and instruction to a broader audience of researchers and post-graduate students in education and psychology. EARLI members are fully encouraged to submit their current research on the association's journals.
The meet the editors symposium aims to inform the EARLI members about the specific aims of each journal, how to select the right journal to publish your research and they will advise you on how to make successful submissions to the journals. This is an audience-initiated session and participants are invited to raise any question or issue they feel pertinent.

Learning and Instruction
Presenting Author: Gert Rijlaarsdam, University of Amsterdam, Netherlands

Learning and Instruction is an international, multi-disciplinary, peer-refereed journal. The journal provides a platform for the publication for the most advanced scientific research in the areas of **learning**, **development**, **instruction** and **teaching**. It welcomes original empirical investigations. The papers may represent a variety of theoretical perspectives and methodological approaches. They may refer to any age level, from infants to adults and to a diversity of learning and instructional settings, from laboratory experiments to field studies, and from large-scale quantitative studies to case studies. The major criteria in the review and the selection process concern the significance of the contribution to the area of learning and instruction, and the rigor of the study. Studies may contribute to general areas of learning and instruction or to specific domains of learning.

Educational Research Review
Presenting Author: Hans Gruber, University of Regensburg, Germany

Educational Research Review is an international peer-reviewed journal aimed at researchers and various agencies interested to review studies in education and instruction at any level. The journal welcomes different types of systematic review-studies, theoretical contributions and shorter forum - papers but does not publish original empirical investigations.

Frontline Learning Research
Presenting Author: Nina Bonderup Dohn, University of Southern Denmark, Denmark

EARLI decided to found a new journal in order to open more publishing opportunities for high level manuscripts. The particular aim was to explore open access publishing and emphasize innovative and risk-taking research in the field of learning and instruction. Frontline Learning Research (FLR) is an open-access electronic-only journal that publishes articles on issues and trends occurring internationally in research on learning and educational sciences. FLR is a forum for multidisciplinary research on learning and learning environments and it aims at enhancing new theoretical and methodological approaches in learning sciences. FLR also welcomes commentaries aimed at triggering discussion about important theoretical and methodological questions about the published articles. During this session we will discuss the guidelines more deeply and help participants to recognize what features make manuscripts innovative and risk-taking.

New Perspectives on Learning and Instruction
Presenting Author: Isabel Raemdonck, Université Catholique de Louvain, Belgium

New Perspectives on Learning and Instruction is the international, multidisciplinary book series of EARLI and is published by Routledge.
The aim of the series is to present to the scholarly community high quality, theoretically-driven research on a specific theme in the domain of learning and instruction. Books that are published in the series are innovative, attempting to forge new conceptions of the field. Originality, scientific merit, and significance for the field are what guide the series. Both edited collections and sole-authored texts that meet these criteria are considered for publication.
The focus of the Book Series is on European work, however, contributions from non-European researchers and non-members of the European Association for Research in Learning and Instruction are invited. The series is designed to appeal to a wide audience of researchers and post-graduate students in education and psychology.
Latest Book: Dialogues between Northern and Eastern Europe on the Development of Inclusion: Theoretical and Practical Perspectives
Edited by Natallia Bahdanovich Hanssen, Sven-Erik Hansén, Kristina Ström (2021).

Session E 3

23 August 2023 12:00 - 13:30
UOM_R08
Symposium
Teaching and Teacher Education

Teachers' and school staff members' agency, expertise and ties to colleagues

Keywords: Inclusive Education, Informal Learning, Mathematics/Numeracy, Migrant / Refugee and Minority students, Peer Interaction, Secondary Education, Social Aspects of Learning and Teaching, Social Interaction, Teacher Professional Development, Teaching Approaches
Interest group: SIG 14 - Learning and Professional Development
Chairperson: Tuire Palonen, University of Turku, Finland

Organiser: Tuire Palonen, University of Turku, Finland
Discussant: Michael Goller, University of Kassel, Germany

The symposium focuses on the dynamics between teachers' agency, expertise and social relationships. How teachers mobilize their relational agency; how resources, ideas, advice and knowledge flow within school communities? Teachers exercise agency by adopting, adapting or challenging existing practices according to their own understanding of what is desirable and possible. We aim to elaborate school staff members' agency through professional and relational lenses. Professional agency is seen influencing at work practices (e.g., developing, decision making, pedagogical) and identity (re)negotiation. Relational agency encompasses teachers' ties with others. Teacher expertise consist of knowledge and skills needed in providing optimal support for students' learning. Teacher expertise develops in practice and within professional networks. Expertise development includes continuous improvement but also arrested development. The network perspective allows simultaneously focus on the overall social structure of a school, and on the expertise and resources exchanged through interactions. Several methodologies and data gathering instruments are employed: surveys, online logs, interviews and Social Network Analysis (SNA). We aim to study how school staff members differ in professional agency (Study 1)? How teachers are involved with students, their families, school colleagues and specialists (relational agency, Study 2). Connections between teacher agency and social relationships are explored (Study 3), and how teachers' content knowledge relates to the resources reached out through social relationships (Study4). Three of the studies in the symposium refer to challenges with migration and one study is related to mathematic teachers. Data for the symposium is collected in four countries, in 14 schools.

School staff members' professional agency in Finland, Scotland, and Sweden – a comparative study
Presenting Author:Päivi Hökkä, University of Tampere, Finland; **Co-Author:**Katja Vähäsantanen, Häme University of Applied Sciences, Finland; **Co-Author:**Eija Räikkönen, University of Jyväskylä, Finland

Professional agency has been widely addressed in investigations of learning and work, especially within educational organizations. Most of the studies in educational contexts have been small-scale and qualitative in nature, and the comparative research designs have been scarce. Furthermore, the research has mainly focused on teachers' work and ignored other professionals within educations fields. Thus, this study aims to compare school staff's professional agency in three countries (Finland, Scotland, and Sweden) and to understand the factors that are related to their professional agency. We understand professional agency through behavioural lenses and rely on subject-centered socio-cultural approach that emphasize professional agency as influencing at work and identity (re)negotiation.
We collected electronically survey data from 407 informants by utilizing the short version of professional agency measure (PAM) that consisted of nine items assessing three validated dimensions of professional agency (Influencing at work, Participation at work, and Negotiating professional identity). The questionnaire also covered participants' background information. In analysing the data, we utilized structural equation modelling. This study confirms the structure of professional agency among the staff across the three countries. We will also examine the differences in the staff's professional agency across the three countries considering their national contexts. Finally, we will examine how gender, age, professional post, and work contract are connected to professional agency.

Teachers' relational agency within professional networks for supporting migrant students
Presenting Author: Natasa Pantic, University of Edinburgh, United Kingdom; **Co-Author:**Marc Sarazin, University of Edinburgh, United Kingdom; **Co-Author:**Thibault Coppe, University of Groningen, Netherlands; **Co-Author:**Didem Oral, University of Stockholm, Sweden; **Co-Author:**Eveliina Manninen, University of Jyväskylä, Finland

This study examines teachers' relational agency – working flexibly with school colleagues and other professionals – as a mechanism for mobilising resources to support migrant students' integration in schools. We consider how collaboration networks of teachers and other school staff shape inclusive practices for supporting migrant students. Data on teachers' relational agency was collected via online logs and complemented with interview and social network data from staff surveys in 7 schools in Finland, Scotland and Sweden. This study employed a mixed-method design combining qualitative analysis of interviews and online logs, stochastic actor oriented statistical models, and innovative data visualisations. The study's focus on relational agency allows us to illuminate the mutually formative influence of agency and structures by examining how expertise and resources are exchanged through interactions in which teachers and other actors reach out to other actors within the school community and beyond to mobilise support for migrant students. We interpret these interactions in terms of their alignment to the principles of inclusive pedagogy – a distinctive way of thinking about supporting migrant students within educational provision that is ordinarily available to all students.

Teacher agency and ties to colleagues. A Survey study from two Finnish schools.
Presenting Author: Tuire Palonen, University of Turku, Finland; **Co-Author:**Eveliina Manninen, University of Jyväskylä, Finland; **Co-Author:**Päivi Hökkä, University of Tampere, Finland

The aim of this study was to explore school staff members' social ties, both for instrumental (information seeking, collaboration, migrate student support) and expressive (emotional support and inspiration giving) network dimensions and whether teachers' agency, understood as a capacity to respond critically to problematic situations, is related to these ties. The participants (N=111) coming from two school communities in Finland were teachers, principals and other professionals, working for various pupil support tasks. Data were collected along two different questionnaires designed to measure social relations (Social Network Analysis, SNA survey) and teacher agency. For agency, a 9-item PAM scale sum variable was employed. Regarding social ties SNA analysis revealed a similar tie distribution in both school communities, emphasis being expectedly in instrumental ties. Further, statistically significant positive correlation was found for teacher agency and all other network dimensions, except emotional support seeking. Work role, analysed by t-test between the teachers and staff members in the pupil support tasks, indicated differences in collaboration (outgoing ties $t=-2,182$, (106); $p< 0.05$ and incoming ties $t=-2,072$; (39,881), $p< 0.05$), migrate students' support (incoming ties $t=-2,331$ (47,414); $p< 0.05$) and agency ($t=-2,040$, (104); $p< 0.05$) so that teachers' values were lower for each variable. The results showed expectedly highest connection between instrumental ties and teacher agency. Social network analysis can contribute to teacher expertise studies by showing how teachers' informal relationships support their professional development and how teacher agency is seen from social relationships' perspective.

Can mathematics teachers' pedagogical content knowledge predict their professional influence?
Presenting Author: Monika Grigaliuniene, Vytautas Magnus University, Lithuania; **Co-Author:**Erno Lehtinen, University of Turku, Finland

The aim of this study was to investigate possible connections between the length of teachers' professional career, their professional status within the social network of colleagues (advice size), and their pedagogical content knowledge. Advice size value refers to how typically colleagues' ask pedagogical advice from the person. The participants were 39 mathematics teachers from seven Lithuanian secondary schools. Data were collected by a questionnaire designed to measure pedagogical content knowledge ($\alpha= .832$) and by a social network analysis rating. Data analysis revealed a statistically significant moderate positive correlation between years of professional activity and advice size (0.437), moderate negative correlation (-0.424) between pedagogical content knowledge and advice size, and no significant correlation between years of professional activity and pedagogical content knowledge. Contrary to the assumption, teachers' advice size value was negatively correlated with teachers' pedagogical content knowledge. Cluster analysis resulted in four clusters which showed that teachers with short career had highest pedagogical content knowledge, but other teachers do not ask their advice. Teachers with long careers and high advice size were divided in two clusters, one with low and one with high pedagogical content knowledge.

Session E 4

23 August 2023 12:00 - 13:30
UOM_CH
Symposium
Teaching and Teacher Education

Teaching and Learning Economics with Visual Representations

Keywords: Citizenship Education, Competencies, Comprehension of Text and Graphics, Knowledge Construction, Qualitative Methods, Quantitative Methods, Secondary Education, Social Sciences and Humanities, Teaching/Instructional Strategies
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Malte Ring, University of Tübingen, Germany
Organiser: Malte Ring, University of Tübingen, Germany
Discussant: Stefanie Findeisen, University of Konstanz, Germany

Visual representations are a central tool in teaching and learning domain knowledge. In economic education, visual representations represent abstract – often mathematical – principles, such as the relationship between supply and demand and their role in pricing. Although regularly used in teaching economics in secondary and higher education, their use does not necessarily promote a more thorough understanding of the underlying domain model (or principle). With the overarching aim to better understand the prerequisites of successfully teaching and learning with visual representations in economics, we explore the relationship between visual representations and conceptual understanding. In this symposium, we combine different empirical methodological approaches to analyze how (well) learners deal with visual representations and how the format of the representations influences conceptual understanding. In the first presentation, results are presented of a graph competence test with a focus on what makes graph questions difficult. In the second presentation, qualitative results are presented focusing on the connection between economic understanding of pricing with the help of a diagram. Presentation three discusses how different visual representations of pricing affect the teaching-learning practices in the classroom and thus what learning is made possible. The final presentation discusses how models used in social studies teaching can help students grasp the complexity and changeability in economic issues and systems. The first presentation focuses on the assessment of students' abilities in higher education whereas the other three presentations analyze learning processes in secondary education. All presentations discuss how teaching and learning with visual representations in economics can be successfull.

What Makes Graph Tasks Difficult in Economics? Results from a Graph Competence Assessment Study
Presenting Author: Malte Ring, University of Tübingen, Germany; **Co-Author:**Luis Oberrauch, University of Tuebingen, Germany

Economists use graphs to present and analyze relationships, for example in the supply and demand model. The ability to understand and work with these graphs is at the core of economic thinking and is also one of the central challenges for novices in the field. So far, researchers have mainly analyzed the effect of adding graphs to lectures and the effect of certain graph formats on conceptual understanding. In contrast, this research project aims to model graph competence as domain-specific procedural knowledge. To measure graph competence, we first defined six subcomponents in a theoretical framework: reading, interpreting, choosing the right graph to display a relationship, using the graph in an example, identifying errors in a graph, and evaluating the underlying model assumptions. For each of these subcomponents, we developed items for three types of graphs: the supply and demand model, cost curves and indifference curves. The instrument was administered as an online survey at multiple higher education institutions in south-western Germany with students of different academic disciplines. Using item response theory (IRT) with a sample of 579 students, we find that the instrument is suited to measure graph competence and that the items capture a broad range of ability levels. For the symposium we focus on what tasks were particularly difficult for learners and discuss several pedagogical implications for teaching and learning with visual representations in economic education.

Effects of the representation of economic models with graphs on learners' ability to think in models
Presenting Author: Jana Doris Franke, University of Education Freiburg, Germany, Germany; **Co-Author:**Franziska Birke, Institute for vocational training and economic education, Germany

Graphs as a visualization of mathematical modelling of economic models are used in many ways in economic education, for example, to show systematic relationships of a model or as an analysis tool. It is yet unclear to which extent learners can deal with graphs as a representation of an economic model and what effects the representation of an economic model using a graph has on the learners' ability to think in models. Due to the empirically proven subject specificity and contextuality of graphical understanding, the broad research findings from the field of science and mathematics cannot be unconditionally applied to economic education. To better understand the challenges and the process of learning with graphs, we interviewed learners in secondary education. Specifically, we focused on the ability of students to think in economic models using the example of pricing and its visual representation through the price-quantity graph (Marshall`s graph). Preliminary results show both challenges and difficulties of learners in using the price-quantity graph as well as some effects of the representation on model comprehension. Based on the results of the evaluations, implications of graphs as a challenge and consequences for economic education will be discussed.

Representing or affording? Visual representations in economics teaching as an agent in the classroom
Presenting Author: Ann-Sofie Jägerskog, Stockholm University, Sweden

In economics teaching, supply/demand graphs are frequently used as a visual tool to help students understand the complex relationships involved in pricing. Previous studies have investigated students' understanding of graphs, identifying several challenges related to learning economics through graphs. What has not been investigated further is how visual representations used in teaching economics affect the teaching practice established in the classroom and thus what learning is afforded. This empirical study aims at doing just that. In a series of three lessons, four upper secondary classes were introduced to economics and pricing. Two classes had lessons based on traditional supply/demand graphs and two on a causal loop diagram. The introductory lecture as well as small group discussions were transcribed and analysed to identify teachers' and students' communicative actions during this lesson and goals driving them. Based on this analysis, conclusions were drawn concerning the relationship between teaching practices established and what visual representation was used in teaching. Results suggest that the teaching practices established in causal loop diagram-based classrooms could be characterised as epistemic practices, where discussing and learning about pricing was the main object. In contrast, teaching practices established in graph-based classrooms were characterized by a focus on the visual representation as such and the logics behind it, rather than discussing the inner workings of the causal relationships involved in pricing. The study has educational and theoretical significance in terms of practical implications for teaching and discussions concerning what is afforded through different visual representations of the same subject content.

Visualising complexity and changeability - critical aspects of teaching visual models in economics
Presenting Author: Malin Tväråna, Uppsala University, Sweden, Sweden; **Co-Author:**Ann-Sofie Jägerskog, Stockholm University, Sweden; **Co-Author:**Mattias Björklund, Stockholm University, Sweden; **Co-Author:**Sara Carlberg, n/a, Sweden; **Co-Author:**Patrik Gottfridsson, n/a, Sweden; **Co-Author:**Therese Juthberg, n/a, Sweden; **Co-Author:**Robert Kenndal, n/a, Sweden; **Co-Author:**Marie Losciale, n/a, Sweden; **Co-Author:**Jenny Rosengren, n/a, Sweden; **Co-Author:**Per Sahlstrom, n/a, Sweden; **Co-Author:**max Strandberg, Stockholm University, Sweden

The aim of this presentation is to discuss how models used in social studies teaching can help students grasp the complexity and changeability in economic issues and systems in the context of social science education (SSE). Models are often used in SSE teaching to help students grasp complexity and changeability. However, students often find models difficult to understand and there is a risk that seemingly fixed models do not offer an understanding of the changeability in societal issues. The project investigates students' conceptions of two different models that are commonly used in SSE (one flowchart and one plot diagram) and what aspects that need to be discerned in order for students to reason in a qualified way about the content illustrated. Results from a phenomenographic analysis of 21 group discussions (with students from both compulsory and upper secondary school) show that the critical aspects identified in part can be understood as model and content specific, but in part as model generic. By comparing the critical aspects for the two different models, it is evident that in order to read both models, aspects pertaining to structure, casual expansion, and human agency are important.

Session E 5

23 August 2023 12:00 - 13:30
UOM_A02
Symposium

Teaching and Teacher Education

Team teaching, a promising strategy? Empirical insights from Norway, South-Africa, and Flanders

Keywords: In-service Teachers, Pre-service Teachers, Social Aspects of Learning and Teaching, Teacher Effectiveness, Teacher Efficacy, Teacher Professional Development, Teaching Approaches, Teaching/Instructional Strategies
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Hanne Tack, Ghent University, Belgium
Chairperson: Ruben Vanderlinde, Ghent University, Belgium
Organiser: Hanne Tack, Ghent University, Belgium
Organiser: Mathea Simons, University of Antwerp, Belgium
Discussant: Elke Struyf, University of Antwerp, Belgium

The international research literature on team teaching offers an overall positive appraisal of team teaching for both teachers and learners (Baeten & Simons, 2014; 2016; Fluijt et al., 2016; Schmulian & Coetzee, 2019; Solheim, 2019; Walsh, 2020). Team teaching – a collaborative teaching model, also referred to with synonyms such as co-teaching and collaborative teaching – concerns “two or more teachers in some level of collaboration in the planning, teaching and/or evaluation of a course” (Baeten & Simons, 2014, p. 93). Team teaching could address challenges such as the growing heterogeneity of the student population, high attrition rates of beginning teachers, educational reforms and innovations. Despite its promising character, scant empirical evidence has been published with convincing data on team teachings’ effectiveness. This symposium focusses on advancing insights in team teaching and its effectiveness, by presenting four different and complementary perspectives from three countries. In so doing, we aim to contribute to the international state-of-the-art on team teaching theory, by presenting (1) a large-scale cross-sectional survey study on team teaching in Flanders, (2) a mixed-methods study on the role of shared responsibility as a predictor of student achievement during team teaching in Norway, (3) the development and validation of the learners’ team teaching perception questionnaire in South Africa and Flanders, and (4) a study on the preference of South African undergraduate students for specific team teaching models. Based on the insights from the different perspectives, the discussion aims to settle a first international agenda for research, policy, and practice on team teaching.

A state-of-the-art on team teaching practices in Flanders: Results of a large-scale survey study
Presenting Author: Aron Decuyper, Ghent University, Belgium; **Presenting Author:**Dries De Weerdt, University of Antwerp, Belgium; **Presenting Author:**Dries Mariën, University of Antwerp, Belgium; **Co-Author:**Hanne Tack, Ghent University, Belgium; **Co-Author:**Mieke Meirsschaut, mieke.meirsschaut@arteveldehs.be, Belgium; **Co-Author:**Ruben Vanderlinde, Ghent University, Belgium; **Co-Author:**Mathea Simons, University of Antwerp, Belgium; **Co-Author:**Elke Struyf, University of Antwerp, Belgium

Team teaching is a promising strategy where teachers are collaboratively engaging in teaching activities. Based on the level of collaboration between the teachers, five team teaching models are distinguished in the literature (i.e., the observation model, the coaching model, the assistant teaching model, the equal status model, and the teaming model). Despite its promising character as a teaching strategy, like most other European countries, a state-of-the-art on team teaching practices in Flanders is still lacking. To address this gap, this study presents the results of a large-scale cross-sectional survey study completed. As such, the research question is: “*How is team teaching implemented in Flanders?”.* A total of 656 teachers experienced with team teaching from 86 schools completed the questionnaire. The findings show that when it concerns the use of the models of team teaching, most teachers report they use a mix of team teaching models (n=195; 33%). Also, the assistant teaching model – where one teacher assists the *“responsible”* classroom teacher – is a quite common practice (n=149; 25%). However, large, and significant differences were found for the level of education on the use of team teaching (with medium and large effect sizes). These, and other important relations related to the implementation of team teaching will be presented. Based on this survey study, measurement instruments are developed and validated to further grasp team teaching practices. In so doing, the utilization potential of both our findings and the developed instruments is high and evident.

Shared responsibility between team teachers predicts student achievement – A Norwegian study
Presenting Author: Aslaug Fodstad Gourvennec, University of Stavanger, Norway; **Presenting Author:**Oddny Judith Solheim, The Norwegian Reading Centre, Norway; **Co-Author:**Per Henning Uppstad, Norwegian Reading Center, Norway; **Co-Author:**Erin McTigue, Fakultet for utdanningsvitenskap og humaniora Nasjonalt senter for leseopplæring og leseforsking, Norway

Shared responsibility between teachers is regarded as a prerequisite to successful co-teaching/team teaching. However, few studies have investigated whether shared responsibility between teachers actually leads to improved student achievement. This mixed methods study investigates shared responsibility in a sample of 148 classrooms where two general educators worked collaboratively in literacy instruction through first and second grade. First, we analyzed whether the degree of shared responsibility between the two teachers for planning, enacting and evaluating literacy instruction predicted student reading when controlling for pre-reading skills at baseline. Second, we carried out in-depth individual interviews with six collaborative teacher dyads purposefully selected from high- and low-performing classrooms to investigate what characterized their sharing of responsibility. The results show that shared responsibility significantly predicts student reading achievement. Further, the interviews reveal a surface level collaboration between co-teachers in low-performing classes, yet a more profound level of collaboration with influence on key teaching decisions in high-performing classes.

Measuring learners’ perceptions of a team-taught learning environment: Development and validation
Presenting Author: Mathea Simons, University of Antwerp, Belgium; **Co-Author:**Stephen Coetzee, University of Pretoria, South Africa; **Co-Author:**Marlies Baeten, KU Leuven, Belgium; **Co-Author:**Astrid Schmulian, University of Pretoria, South Africa

Team teaching is a teaching model in which teachers work collaboratively in the preparation, teaching and evaluation of a course. Literature suggests that team teaching potentially provides rich and varied lessons, increased support and learning gains. However, team teaching could possibly also cause some confusion. To support the implementation of team teaching, stakeholders (teachers and policy makers) require an instrument that offers learners insights to support their decision making. We describe the development and validation of an easy-to-use questionnaire to explore learners’ perceptions of team teaching. The questionnaire was developed and validated in four stages: an extensive literature review (1) resulted in a preliminary version of the questionnaire (2) containing advantages and disadvantages for learners of team teaching. Next, a pilot study (3) was conducted, followed by a validation study (4) based on confirmatory factor analysis in two different learning environments of secondary education (Belgium, n=229 pupils) and higher education (South Africa, n=350 students). The final questionnaire comprises 16 items and four factors and appears to be valid, internally consistent, and reliable.

To Team or Not to Team: Undergraduate Students’ Perspectives of Two Teachers Simultaneously in Class
Presenting Author: Stephen Coetzee, University of Pretoria, South Africa; **Presenting Author:**Astrid Schmulian, University of Pretoria, South Africa

We report on a study that explored undergraduate accounting students’ experience of team teaching. In particular, we explored the students’ (n = 350) perspectives of the relative advantages and disadvantages of teaming, as a form of team teaching, in contrast to the more widely adopted equal status model of team teaching. The results suggest that the students assessed the teaming and equal status models of team teaching positively. They were, however, statistically significantly more positive about the advantages of the teaming model (M = 3.52) compared to the equal status model (M = 3.12) ($F = 3.321$, $p = 0.000$). A larger majority of the students (n = 275, 79%) indicated a stronger preference for the teaming model, as compared to the equal status model. The teaming model provided students with classes that, from their perspective, were more interesting, aided their understanding, and provided them with faster and more individualized support than the equal status model. In adopting the teaming model, teachers should, however, consider sources of possible confusion and intimidation.

Session E 6

23 August 2023 12:00 - 13:30
UOM_A03

Symposium
Cognitive Science

Interventions for multiplicative reasoning: Advocating an early start and attention to transfer

Keywords: Cognitive Development, Conceptual Change, Early Childhood Education, Mathematics/Numeracy, Primary Education, Teaching/Instructional Strategies
Interest group: SIG 03 - Conceptual Change
Chairperson: Xenia Vamvakoussi, University of Ioannina, Greece
Organiser: Wim Van Dooren, KU LEUVEN, Belgium
Organiser: Xenia Vamvakoussi, University of Ioannina, Greece
Discussant: Andreas Obersteiner, Technical University of Munich, Germany

This symposium presents intervention studies aiming at stimulating multiplicative and proportional reasoning competences in primary and pre-primary students. Multiplicative and proportional reasoning are notoriously difficult for students to develop and to exhibit in out-of-school settings. This seemingly contrasts with evidence that precursors of such competences are present and develop at a much earlier age than traditionally assumed. Three papers show that fostering such competencies ais feasible considerably earlier than is currently the case in instruction. Christou and Kandyli show that a minimal intervention via a game-based activity promoted kindergarten children's ability to solve measurement division problems. Pitta and Vamvakoussi designed activities to support kindergarten children's multiplicative reasoning for discrete and continuous quantities in parallel that promoted substantially their problem-solving competences in non-instructed tasks. Vanluydt, Verschaffel, and Van Dooren developed improved second graders' quantitative reasoning and solutions of missing-value proportional problems, as well as relevant vocabulary. On the other hand, Määttä and colleagues are concerned with students' ability to engage in multiplicative reasoning without guidance. They compared an intervention aiming at fostering fifth graders' tendency to spontaneously discern multiplicative relations in everyday situations with one that promoted fraction knowledge valued in school contexts; they found that the first led to more transferable Knowledge. The four studies not only indicate that it is feasible and fruitful to invest on early stimulation of multiplicative and proportional reasoning competences; and to facilitate related knowledge transfer, they also point at the instructional design principles that learning environments can build on.

Early understanding of measurement division: the effects of a minimal intervention via game activity
Presenting Author: Konstantinos Christou, Aristotle University of Thessaloniki, Greece; **Co-Author:**Anastasia Kandyli, University of Western Macedonia, Greece

We present part of an ongoing design research study aiming at developing activities that promote multiplicative reasoning in early instruction. Specifically, we report on the effects of a game-based activity on children's ability to solving problems pertaining to measurement division (i.e., dividing a quantity into an unknown number of equal groups of a measured quantity), deemed the most challenging aspect of division, particularly for young children. The participants (14 kindergarten children, age 4-6) were pre- and post-tested via individual task-based interviews. They participated in a whole-class activity (approx. 1 hour long) during which they played a game that elicited thinking about equal-grouping. Specifically, the teacher called a number and the children formed equal groups with the size of this number. The participants counted the size of each group, and the number of groups and reported their findings. At the end of each round, the children were asked to make comparisons with the previous one in order to notice the relationships between the size and the number of the groups. The results showed that this minimal intervention improved children's ability to solve measurement division problems. The children employed distribution as well as equal-grouping strategies. In addition, some children also verbalized a fundamental principle of division ("more groups, smaller size") reflecting the inverse proportional relationship between the divisor and the quotient. These results indicate that quite advanced multiplicative reasoning abilities can be fostered in the early years, using learning environments that are challenging, motivational and focused on deep mathematical structures.

Fostering early multiplicative reasoning: An ongoing design research study
Presenting Author:GEORGIA PITTA, University of Ioannina, Greece, Greece; **Co-Author:**Xenia Vamvakoussi, University of Ioannina, Greece

We present part of an ongoing design research study aiming at developing a program of activities to support early multiplicative reasoning. The three pillars of the program are a) addressing various multiplicative situations for discrete and continuous quantities in parallel, b) providing experiences with three fundamental multiplicative operations (iterating a quantity, equi-partitioning, and measurement), and c) introducing vocabulary for multiples and submultiples. Points (a) and (c) are typically not pursued in early math instruction. We developed three story-based activities. The first introduces terms for multiples and submultiples based on multiplicative comparison. In the second, children solve missing value proportional problems. The third focuses on multiplicative change using "fraction machines". We implemented these activities with 22 kindergarten children (9 and 13 children in their first and second kindergarten year, respectively). The children were pre- and post-tested with tasks different than the intervention tasks. Our research questions were whether these activities would be within the reach of pre-primary children; and whether they would promote their multiplicative competences. During the intervention, we found that all children engaged with the activities, but most of the younger ones needed substantial support. The older children gradually needed less support, adopted the intended strategies, and invented new ones. After the intervention, the older children as well as two of the younger ones improved substantially their multiplicative reasoning competences in terms of problem solving, for discrete as well as continuous quantities. These results indicate that quite advanced multiplicative reasoning competences can be fostered earlier than typically assumed.

Stimulating the early development of proportional reasoning: An intervention with second graders
Presenting Author: Wim Van Dooren, KU Leuven, Belgium; **Co-Author:**Elien Vanluydt, KU Leuven - University of Leuven, Belgium; **Co-Author:**Laure De Keyser, KU Leuven, Belgium; **Co-Author:**Lieven Verschaffel, KU Leuven, Belgium

Children, but also adults often suffer from difficulties in (learning to) reason proportionally. However, research increasingly shows that the emergence of proportional reasoning abilities starts rather early, several years before it is typically introduced in school. Only a few attempts have been made to stimulate this early emerging ability. The current study aimed to stimulate proportional reasoning in second graders. An intervention was developed with a focus on quantitative reasoning and at promoting different strategies to solve missing-value proportional problems. The effectiveness was tested in a pretest-intervention-posttest study with a control group (n=139). A large effect of the intervention was seen on children's proportional reasoning abilities in fair-sharing situations. A small transfer effect was found to word-problem solving, and a moderate effect on the proportional vocabulary that was part of the intervention.

Adaptive or routine expertise in promoting spontaneous focusing on multiplicative relations
Presenting Author: Jake McMullen, University of Turku, Finland; **Co-Author:**Saku Määttä, University of Turku, Finland; **Co-Author:**Antti Koskinen, University of Tampere, Finland, Finland; **Co-Author:**Hilma Halme, University of Turku, Finland; **Co-Author:**Kristian Kiili, Tampere University, Finland; **Co-Author:**Minna Hannula-Sormunen, University of Turku, Finland

A major goal of mathematics education is the use of mathematical knowledge in everyday life. However, many students fail to spontaneously use their existing mathematical knowledge in situations that are not explicitly mathematical, including everyday situations. Within students'' existing mathematical competences a tendency of spontaneous focusing on multiplicative relations (SFOR) has been identified as an indicator of a tendency to spontaneously use multiplicative relations in non-explicitly mathematical situations. Individual differences in SFOR and fraction knowledge have been found to predict each other's development.

The present quasi-experimental classroom intervention study aims to compare the effectiveness of two interventions at promoting 5^{th} grade students' (n = 306) SFOR tendency. The Spot-the-relations intervention is expected to promote adaptive expertise, in the intervention students engage in non-routine tasks that are conceptually rich, require meaning-making and allow for multiple interpretations by practicing recognizing and describing multiplicative relations in everyday situations. The Number-line-estimation intervention is expected to promote more routine expertise, in this intervention students' fraction conceptual knowledge is targeted. Results indicate that the Spot-the-Relations intervention more strongly supported students' ability to recognize and describe multiplicative relations, while the Number-line-estimation intervention more strongly supported students' routine fraction conceptual knowledge. While both interventions led to improvements in SFOR tendency, the Spot-the-Relations intervention led to significantly larger improvements than the Number-line-estimation intervention. These results confirm previous theoretical arguments that learning environments that support adaptive expertise will lead to more readily transferable

knowledge, in this case, using multiplicative relations in everyday situations.

Session E 7

23 August 2023 12:00 - 13:30
AUTH_T002
Symposium
Educational Policy and Systems

Reimagining education: from research to policy and practice

Keywords: Artificial Intelligence, Communities of Learners and/or Practice, Curriculum Development, Educational Policy, Educational Technologies, Ethics, Researcher Education, Social Aspects of Learning and Teaching, Synergies between Learning / Teaching and Research, Teacher Professional Development, Well-being
Interest group:
Chairperson: Nienke van Atteveldt, Vrije Universiteit Amsterdam, Netherlands
Discussant: Jo Van Herwegen, United Kingdom

Uncertain times need creative and collective endeavors. The International Science and Evidence Based Education Assessment (ISEEA) by the UNESCO Mahatma Gandhi Institute of Education for Peace and Sustainable Development (MGIEP) set out to answer two urgent questions: a) Are education systems still serving the right purpose? and b) How can education systems adapt themselves to address the pressing challenges we face today? The first-of-its-kind assessment of education systems, the ISEEA report brought together multi-disciplinary expertise to provide a scientifically robust and evidence-based assessment to inform education policymaking at all levels and scales. The full report 'Reimagining Education', with a Summary for Decision Makers (SDM), was launched in March 2022. This symposium will present and further discuss the main findings and implications of the ISEEA for education practice and policy. The first presentation will discuss the background and approach undertaken by ISEEA to answer the two questions above and the key findings. The second presentation will discuss the research gaps as revealed by the ISEEA that resulted in a transdisciplinary global research agenda for education. One of the most important findings of the ISEEA was the urgent need to establish the science-policy interface in education to strengthen the science-policy nexus. The third presentation will highlight the features of data and evidence required to mandate policy interventions in education practices. The final presentation will discuss the emerging and critical role of technology and AI in both driving and implementing large-scale education transformation both in learning and assessment.

The International Science and Evidence based Education (ISEE) Assessment: aims and findings
Presenting Author: Nandini Chatterjee Singh, UNESCO Mahatma Gandhi Institute of Education for Peace and Sustainable Development, India; **Co-Author:**Nienke van Atteveldt, Vrije Universiteit Amsterdam, Netherlands

The UNESCO Mahatma Gandhi Institute of Education for Peace and Sustainable Development (MGIEP) embarked on the ambitious International Science and Evidence Based Education (ISEE) Assessment in 2019, and in spite of the challenges presented by the COVID-19 pandemic, has since commendably convened over 300 scientists and experts from 45 countries from diverse disciplines. The findings presented in ISEEA report will undoubtedly pave the way for policy and decision making for future education systems since the world now needs, more than ever, visions for a future that must be more sustainable, resilient, socially just and fair. This first presentation will discuss the background and approach undertaken by ISEEA and its key findings.

A global research agenda for evidence-based education
Presenting Author: Grégoire Borst, Université Paris Cité - CNRS, France

The UNESCO Mahatma Gandhi Institute of Education for Peace and Sustainable Development (MGIEP) embarked on the ambitious International Science and Evidence Based Education (ISEE) Assessment in 2019, and in spite of the challenges presented by the COVID-19 pandemic, has since commendably convened over 300 scientists and experts from 45 countries from diverse disciplines. The findings presented in ISEEA report will undoubtedly pave the way for policy and decision making for future education systems since the world now needs, more than ever, visions for a future that must be more sustainable, resilient, socially just and fair. The second presentation of this symposium will discuss the research gaps as revealed by the ISEEA that resulted in a transdisciplinary global research agenda for education.

How to strengthen evidence-based policymaking in education
Presenting Author: Jonathan Kay, Education Endowment Foundation, United Kingdom

The UNESCO Mahatma Gandhi Institute of Education for Peace and Sustainable Development (MGIEP) embarked on the ambitious International Science and Evidence Based Education (ISEE) Assessment in 2019, and in spite of the challenges presented by the COVID-19 pandemic, has since commendably convened over 300 scientists and experts from 45 countries from diverse disciplines. The findings presented in ISEEA report will undoubtedly pave the way for policy and decision making for future education systems since the world now needs, more than ever, visions for a future that must be more sustainable, resilient, socially just and fair. This third presentation will highlight the features of data and evidence required to mandate policy interventions in education practices.

Education in the mixed realty
Presenting Author: Anantha Duraiappah, UNESCOMGIEP, India

The UNESCO Mahatma Gandhi Institute of Education for Peace and Sustainable Development (MGIEP) embarked on the ambitious International Science and Evidence Based Education (ISEE) Assessment in 2019, and in spite of the challenges presented by the COVID-19 pandemic, has since commendably convened over 300 scientists and experts from 45 countries from diverse disciplines. The findings presented in ISEEA report will undoubtedly pave the way for policy and decision making for future education systems since the world now needs, more than ever, visions for a future that must be more sustainable, resilient, socially just and fair. This fourth presentation will discuss the emerging and critical role of technology and AI in both driving and implementing large-scale education transformation both in learning and assessment.

Session E 8

23 August 2023 12:00 - 13:30
AUTH_DC2
Symposium
Learning and Instructional Technology

How to improve social presence and decrease orchestration load in hybrid learning environments?

Keywords: Computer-supported Collaborative Learning, E-learning/ Online Learning, Educational Technologies, Emotion and Affect, Engagement, Learning Analytics, Social Aspects of Learning and Teaching, Teaching/Instructional Strategies
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Jan Elen, KU LEUVEN, Belgium
Organiser: Annelies Raes, KU LEUVEN, Belgium
Discussant: Gaëlle Molinari, Switzerland

Hybrid learning environments are defined as an unbounded multi-dimensional fluidity, allowing learners and teachers to move freely between physical, social and organizational spaces, while maintaining their connection with a shared educational endeavor. Although hybridity creates possibilities, it also creates challenges. Regarding the student perspective, previous research has indicated the need for social presence. Previous research mainly focused on comparing onsite and remote student experiences during lectures, yet this symposium also presents recent work on collaborative learning in hybrid classrooms (see

Buseyne et al.). The study of Hauk and Gröschner compares student experiences during whole-group discussion and small-group work in a hybrid classroom. Regarding the teacher perspective, systematic reviews have revealed the challenging role of the teacher. Teachers need to engage in multiple tasks under multiple constraints within their everyday classroom teaching situations which is defined as classroom orchestration. In line with that concept, orchestration load seeks to capture the attentive load teachers encounter when regulating multiple activities and learning processes in real-time. Research focussing on the role of the teacher in the hybrid context is limited, yet this symposium includes ongoing research on that topic. The paper of Kaliisa and Damsa illustrates the use of learning analytics techniques to support teachers' design role in hybrid environments, improving the connections between online and face-to-face activities. Finally Ortega-Arranz et al. investigate the factors influencing teachers' orchestration load. The symposium will be chaired by Jan Elen (KU Leuven) and Gaëlle Molinari (University of Geneva & UniDistance) will provide an overall discussion.

Optimal experience in a hybrid computer-supported collaborative learning setting
Presenting Author: Siem Buseyne, Faculty of Psychology and Educational Sciences, Centre for Instructional Psychology and Technology, KU Leuven Kulak, Belgium; Itec, imec research group at KU Leuven, Imec; CIREL, Centre Interuniversitaire de Recherche en Education de Lille, France, France; **Co-Author:**Celine Vens, KU LEUVEN, Belgium; **Co-Author:**Thierry Danquigny, Université de Lille, France; **Co-Author:**Fien Depaepe, KU Leuven, Belgium; **Co-Author:**Jean Heutte, Université de Lille, France; **Co-Author:**Annelies Raes, KU Leuven, Belgium

More often than ever, universities are shifting towards hybrid forms of learning, not only for lectures but also for other instructional methods, such as collaborative forms of learning. Past research has mainly focused on students' cognitive and motivational factors in hybrid learning settings during lectures. Previous research did not reveal significant differences regarding the cognitive results, yet, significant results were found regarding the affective variables, i.e. stating that students attending a course remotely are generally less engaged compared to students attending the course on-campus. Research investigating collaborative learning in a hybrid setting is however limited. In the current study, students' teamwork experiences during collaborative hybrid learning are investigated. More specifically, this study presents quantitative results on the effect of the learning delivery mode (on-campus vs. remote) on (a) students' team flow experience during a hybrid collaborative learning task and (b) students' individual flow experience and (c) learning gain during the entire hybrid course. Significant results were found between the delivery mode and students' team flow experience, in favor of students participating on-campus. Similarly, significant results were found regarding students' individual flow experience, again in favor of students attending the course on-campus, though only for one of the individual flow aspects. No significant differences were found between students' learning gain based on the delivery mode.

Supporting teachers in hybrid learning environments: The role of learning analytics
Presenting Author: Rogers Kaliisa, University of Oslo, Faculty of Education, Norway; **Co-Author:**Crina Damsa, University of Oslo, Norway

Teachers often struggle to design and guide students in hybrid learning environments. The aim of this contribution is to illustrate the potential of learning analytics (LA) in supporting teachers' learning design roles (e.g., planning and revising learning activities) in hybrid lenvironments. Using data from 7 asynchronous online discussions in a hybrid bachelor's course, we analyzed student interactions (N=34) and the content of the weekly online discussions using social network analysis (SNA) and automated discourse analysis. SNA metrics identified different sub-groups of students (e.g., most active vs. least active), while the content analysis of the discussion forum posts provided a nuanced view of the main concepts used by the students. Based on these findings and in collaboration with teachers, we designed a LA dashboard (Canvas discussion analytics dashboard [CADA]) that visualizes the participation, social interactions, concepts, and the sentiment attached to students' online discussion posts on a need-to-know basis. We evaluated CADA using 10 in-depth interviews with university teachers who used it practice. The findings showed that CADA provided teachers with an easier-to-understand visual representation of large amounts of student information (e.g., misconceptions about a topic) during online discussions. This information enabled teachers to monitor the quality of the online discourse, which they leveraged to make minimal learning design changes and to customize face-to-face classroom activities. While some teachers expressed a need for CADA to include actionable insights, the results underline the potential of LA in supporting teachers' learning design roles in hybrid learning environments.

Teacher's and Students' Perception of Hybrid Classrooms in Secondary School Education
Presenting Author: Alexander Groeschner, Friedrich Schiller University Jena, Germany; **Co-Author:**Dennis Hauk, Friedrich Schiller University Jena, Germany

Due to COVID-19-related school closures, distance and blended learning courses have become relevant educational settings to provide students with flexible modes of participation. In this study, we investigate students' engagement and teacher's motivational support in a blended synchronous learning environment, called a hybrid classroom, in which onsite students (sitting in a real-life, face-to-face classroom) and remote students (connected online to the classroom via video conferencing tools) are taught simultaneously. Therefore, we videotaped four hybrid classroom lessons in two classes (N = 38 students) during one week in Spring 2021 and assessed students' perception through a questionnaire at the end of each lesson. A teacher's interview provided post-hoc reflections upon students' engagement in hybrid classroom settings. Quantitative findings show no differences between onsite and remote-students perception during whole-group discussion. In small-group work, however, onsite students perceived a significant higher agentic and behavioral engagement than the online connected remote-students. The teacher perceived particularly engaging offsite students in whole-class discussions as challenging. Implications are discussed regarding the role of teacher's attention, support, and scaffolding in hybrid classrooms.

Teacher orchestration load while designing and implementing hybrid collaborative activities
Presenting Author: Alejandro Ortega-Arranz, Universidad de Valladolid, Spain; **Co-Author:**Alejandra Martínez Monés, Universidad de Valladolid, Spain; **Co-Author:**Ishari Amarasinghe, Universitat Pompeu Fabra, Spain; **Co-Author:**Yannis Dimitriadis, Universidad de Valladolid, Spain; **Co-Author:**Davinia Hernandez-Leo, Universitat Pompeu Fabra, Spain

The flexibility provided by hybrid learning models has attracted the attention of educational providers, such as Higher Education institutions. Hybrid settings are usually understood as those that involve onsite (i.e., in the classroom) and remote (e.g., in a different classroom, at home) students simultaneously under the instruction of the same teacher. However, designing and conducting lessons is likely to increase the teachers' orchestration load, while the difficulties to set up proper interactions among the onsite and remote students may become a considerable obstacle for implementing collaborative activities. Some tools have been proposed to help tackle these challenges, but there is a need to better understand the factors that influence teachers' orchestration load while using these tools for designing and conducting collaborative activities. This paper outlines a study carried out in a hybrid classroom in which a Jigsaw collaborative pattern was implemented with the Engageli software. The study involved 2 teachers and 67 students enrolled in a subject of a computer science undergraduate course. Preliminary results show that teachers reported a medium-to-high orchestration load for implementing and setting up the collaborative activity in the hybrid classroom. Among the factors that contributed most to such load, teachers highlighted the creation and management of groups and the creation of collaborative documents, given the rather high complexity of a jigsaw activity.

Session E 9

23 August 2023 12:00 - 13:30
UOM_A04
Single Paper
Motivational, Social and Affective Processes

Student Academic Emotions and Interest in Classroom and in Computerised Learning Environments

Keywords: Anxiety and Stress, Argumentation, Artificial Intelligence, Cognitive Skills and Processes, Computer-assisted Learning, Educational Technologies, Emotion and Affect, Interest, Motivation, Secondary Education, Self-efficacy
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Maria Psyridou, University of Jyväskylä, Finland

Do Individual and Contextual Determinants Affect the Development of Emotions? Growth Curve Models.

Keywords: Emotion and Affect, Motivation, Secondary Education, Self-efficacy
Presenting Author: Simon Meyer, University of Erlangen-Nuremberg, Germany; **Co-Author:**Juliane Schlesier, University of Oldenburg, Germany; **Co-Author:**Michaela Gläser-Zikuda, University of Erlangen-Nürnberg, Institute for Educational Science, Germany

Previous studies regarding the transition from primary to secondary school focused mainly on disparities relating to students' regional, socio-economic, and ethnic backgrounds, while affective factors, such as achievement emotions, have been less researched in this context. Especially systematic longitudinal studies that consider individual and contextual determinants on the development of achievement emotions are lacking. Based on prior cross-sectional studies, it is reasonable to assume that higher values of school-related self-efficacy as well as higher levels of intrinsic motivation among early secondary students positively influence the development of positive achievement emotions and prevent students from having negative achievement emotions. Thus, the purpose of the present longitudinal study is to analyze the influence of individual factors (school-related self-efficacy, motivation) as well as environmental determinants on class level (instructional quality, autonomy support) on the development of students' enjoyment and boredom after transition to secondary school. The longitudinal study was conducted from the beginning of 5^{th} grade to the beginning of 6^{th} grade (three measuring points) and included $N = 638$ students (84.9% female) with an average age of $M = 10.19$ (SD = .45). First results of multilevel growth curve models indicate that the decrease in students' enjoyment in the course of the first year of secondary school can be particularly explained by the decline of students' self-efficacy. The increase of students' boredom, on the other side, is particularly induced by their perceived teachers' instructional quality. The theoretical and educational implications will be discussed at the conference.

Individual Differences as Determinants of Boredom and Shame in Socio-Emotional Conflict Situations
Keywords: Anxiety and Stress, Artificial Intelligence, Cognitive Skills and Processes, Emotion and Affect
Presenting Author: Lara Chehayeb, German Research Center for Artificial Intelligence (DFKI), Germany; **Co-Author:**Dimitra Tsovaltzi, DFKI (German Research Center for Artificial Intelligence) / Saarland University, Germany; **Co-Author:**Patrick Gebhard, German Research Center for Artificial Intelligence (DFKI), Germany

Performance tasks in groups like learning in current competitive classroom situations often give rise to socio-emotional conflicts that are grounded in uncertainty and are not easily altered. Besides anger, perceived conflicts may result in shame, or boredom. Boredom is a major factor in learning settings leading to poor academic performance and drop-outs . Individual differences may determine the experience of conflict situations. They influence the ability to regulate one's own emotions in a given situation. Our aim is to inform the development of learner-centered support for effective performance experiences. We investigate the influence of individual differences, social identity, the way we relate to others, and self-consciousness, our proneness to social comparison on emotional regulation, cognitive appraisal of threat, and boredom in conflict situations. Therefore, we conducted an online experiment in a virtual setting (N = 57). To control socio-emotional and cognitive conflict, we created a conflict situation by using a socially interactive agent which shames participants. We tested a moderated mediation model. Results showed that self-consciousness (moderator) moderated the effect of social identity (predictor) on cognitive appraisal of threat (mediator), which then mediated the effect of social identity on boredom (outcome).

Automatically Detecting Affect in Computerized Learning Environments: A Systematic Literature Review
Keywords: Artificial Intelligence, Computer-assisted Learning, Educational Technologies, Emotion and Affect
Presenting Author: Maria Cutumisu, University of Alberta, Canada; **Co-Author:**Lydia González Esparza, The University of Alberta, Canada; **Co-Author:**Minghao Cai, University of Alberta, Canada; **Co-Author:**Iñaki Palestino Díaz, Tecnologico de Monterrey (ITESM), Mexico; **Co-Author:**Genaro Rebolledo Méndez, Tecnologico de Monterrey (ITESM), Mexico; **Co-Author:**Carrie Demmans Epp, University of Alberta, Canada

Affect detection is increasingly viewed as an essential component of computerized learning systems aiming to improve learner outcomes by adapting to learner affect. However, it is not clear what methodologies, emotions of interest, and type of experiments have been reported in the literature. This systematic review analyzes 36 peer-reviewed publications to ascertain how learning-centered affect is automatically detected and analyzed via affect-sensitive computational systems in educational settings. One author reviewed the publications and another author reviewed 15% of these publications, reaching an inter-rater reliability Kappa coefficient of 0.98. Evidence from the reviewed articles shows that most studies (1) were published in the last four years; (2) mainly used facial expressions to detect affect; (3) identified engagement, boredom, frustration, and confusion as the most frequent affective states in learning settings; and (4) used supervised machine learning algorithms to classify learner emotions. The current review aims to ascertain the degree to which educational computational systems can automatically recognize or respond to users' affective states. Moreover, the review aims to investigate whether affect-sensitive interfaces facilitate HCI in terms of enjoyment and effectiveness (e.g., learning gains).This research provides recommendations on how to address several gaps in the literature, including the need to develop: (1) more methodological approaches, both theory- and data-driven, for capturing and analyzing affect; (2) adaptive intelligent educational interfaces that use affective and behavioral states to provide a better learning experience; and (3) affective datasets to improve existing machine learning affect-detecting models.

Maintaining interest: Contrasting the effects of triggered situational and individual interest
Keywords: Argumentation, Computer-assisted Learning, Interest, Secondary Education
Presenting Author: Thorben Jansen, Leibniz-Institut für die Pädagogik der Naturwissenschaften und Mathematik, Germany; **Co-Author:**Lars Höft, IPN - Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Luca Bahr, Leibniz Institute for Science and Mathematics Education (IPN), Germany

Interest is crucial for a meaningful and sustained engagement with complex tasks, especially in settings offering a high degree of autonomy, like digital learning environments (DLEs). According to the Four-Phase Model of Interest Development (Hidi & Renninger, 2006), interest may develop from a fleeting situational (triggered situational (TSI) and maintained situational interest (MSI)) into a more stable individual interest, both sharing the same psychological state of interest experience (IE). Accordingly, IE depends, on one side, on external factors and collative variables and is, hence, highly unstable and occasion-specific. On the other side, IE can be self-generated due to existing knowledge and individual interest, resulting in a cross-situational component. Studies systematically disentangling the occasion-specific and cross-situational components of IE can unravel the effects of temporary external factors and individual interest in related domains on the development of situational interest (SI). Therefore, we conducted an experimental study ($N = 955$) within a DLE and applied latent state-trait analysis to scrutinize the effects of occasion-specific and cross-situational components of IE on the change of MSI across two complex tasks. In addition, we controlled for domain-specific individual interest (DII) to disentangle the effects of TSI and DII. Results revealed that initial MSI and the occasion-specific component of TSI predicted the change in MSI. However, the effect of the cross-situational component of TSI was moderate but insignificant. Likewise, the total effect of DII diminished. Findings underscore the importance of repeatedly triggering students' interest via characteristics of the DLE.

Session E 10

23 August 2023 12:00 - 13:30
UOM_A10
Single Paper
Higher Education, Instructional Design

Instructional Design in Higher Education

Keywords: Attitudes and Beliefs, Cognitive Skills and Processes, Competencies, Example-based Learning, Higher Education, Instructional Design, Quantitative Methods, Science and STEM, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 04 - Higher Education, SIG 14 - Learning and Professional Development, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Daria Khanolainen, University of Jyväskylä, Finland

High-Stakes And High Goals: How Two Learning Goals can be Achieved When Studying Worked Examples
Keywords: Cognitive Skills and Processes, Example-based Learning, Higher Education, Instructional Design

Presenting Author: Nina Udvardi-Lakos, University of Freiburg, Germany; **Co-Author:**Marlene Weirich, Pädagogische Hochschule Freiburg, Germany; **Co-Author:**Julia Asbrand, Humboldt-University Berlin, Germany; **Co-Author:**Alexander Renkl, University of Freiburg, Germany

The use of worked examples can support initial acquisition of cognitive skills. Worked examples in complex domains (e.g., argumentation) often show the skill application in an exemplifying domain. Although learners' focus should remain on the skill and the exemplifying domain is less important, learners need to understand the content knowledge to benefit from worked examples. We examined whether asking students to focus on both content knowledge and skills by using a high-stakes exemplifying domain would allow learners to acquire both skill and content knowledge simultaneously, or whether high-stakes content distracts from and impedes learning the skill. In a training study with $N = 234$ students, we used example-based learning materials. We included an exemplifying domain associated either with high or low stakes for participants, by using content knowledge either relevant or irrelevant for course outcomes. We assessed cognitive load associated with the learning materials, declarative knowledge about the skills, and skill application in argumentation tasks. Incorporating high-stakes content knowledge in the worked examples did not hamper learning outcomes compared to a condition using a low-stakes exemplifying domain, where the high-stakes content knowledge was taught afterwards. Having two simultaneous learning goals (skill and content knowledge) did not increase cognitive load associated with the learning materials. The results suggest that worked examples can be used to integrate and foster both skills and content knowledge when these are associated with high stakes for learners. This finding suggests that worked examples can support two simultaneous learning goals.

Designing professional education for adaptive expertise: case study results

Keywords: Competencies, Higher Education, Instructional Design, Teacher Professional Development

Presenting Author: Loek Nieuwenhuis, HAN University of Applied Sciences, Netherlands; **Co-Author:**Lia Fluit, Radboud University Medical Center, Netherlands; **Co-Author:**Wietske Kuijer-Siebelink, HAN University of Applied Sciences, Netherlands; **Co-Author:**Carla Oonk, Wageningen University, Netherlands; **Co-Author:**Petra Swennenhuis, Fontys University of Applied Sciences, Netherlands; **Co-Author:**Anne Khaled, Hogeschool Utrecht (University of Applied Sciences Utrecht) and HAN UAS, Netherlands

Educational developers are looking for (evidence-based) ways to stimulate adaptive expertise development. Work-based programs should combine traditional novice-expert model with open and ill-structured workplace problems. Lehtinen, Hakkarainen and Palonen (2014) built a learning theory for the professions in times of rapid change. Professional education should support learning to solve complex and ill-structured workplace problems in order to prepare students for future work. Hatano and Inagaki (1986) discern routine expertise en adaptive expertise: routine expertise is the execution of high quality procedures in order to act efficiently and accurately. Adaptive expertise is the power to develop new solutions for professional problems or even new problem solving methods. According to Spiro et al. (2018) adaptivity is trainable by developing a growth mindset instead of a fixed mindset. In the paper we present the results of 11 case studies, executed in 2022. The aim is developing a program theory through realist evaluation of educational practices. In a realist approach theory development and practice-based research go hand-in-hand (Pawson & Tilly, 1997; Pawson et al., 2005). A consortium of 5 regular universities and 6 universities of applied sciences cooperate to evaluate work-based, open-end educational programs enhancing adaptive expertise. We examined the local design theory in use for educating professional students in ill-structured, work based problem contexts. Case studies are based on document analysis, interview sessions with course designers, educators (teachers and practitioners) and students involved. Self-,perception scales on adaptive expertise are administered to the students at the start and the end of the courses.

An analysis of instructional methods in higher education: Differences by course and discipline.

Keywords: Higher Education, Instructional Design, Quantitative Methods, Teaching/Instructional Strategies

Presenting Author: Javier Fernández, Universidad de Leon, Spain; **Co-Author:**Ernesto Panadero, Universidad Deusto, Spain; **Co-Author:**Carlos Rodríguez-Hernández, Institute for the Future of Education, Tecnológico de Monterrey, Mexico; **Co-Author:**Juan Fraile, Universidad Francisco de Vitoria, Spain

Instructional methods are a key area of research in Higher Education. Importantly, most of the studies in the area use convenience samples and/or do not compare the methods across disciplines, which limits the generalizability of the results. To offer a more complete analysis, that we can considered representative, this study explores the instructional methods reported in Spanish universities using a nationwide sample of syllabi. We created a database including all subjects from public universities in the country (N = 78,094) and subtracted a subsample of 1,693 syllabi for analysis. Our results analyzed the type of instructional methods used and the most common instructional profile. Additionally, we looked for differences by academic year and discipline. Our findings showed that university teaching is still led by master classes, especially in the early years. Methods such as portfolios or project-based learning, on the contrary, were more used in later years. We also found differences among disciplines, as social sciences tend to use less master classes and more debate and students' presentations. This study allows us to detect areas of improvement in university teaching, providing valuable information for universities and educators who aim to redesign their instructional methods.

Students' disciplinary values navigation through troubled pasts and contemporary resistances

Keywords: Attitudes and Beliefs, Higher Education, Instructional Design, Science and STEM

Presenting Author: Sugat Dabholkar, GSE-Rutgers University, United States; **Presenting Author:**Julia Gouvea, Tufts University, United States; **Co-Author:**Lawrence Uricchio, Tufts University, United States

Interpreting what is valued in a disciplinary domain and how that aligns or contradicts with personally held values is an important part of disciplinary learning because it can shape students' sense of belonging as well as their current and future participation in the discipline. Our study aims to understand students' disciplinary values navigation in an undergraduate computational biology course. Findings suggest that the resources provided about troubled disciplinary pasts and contemporary resistances in the discipline of computational biology supported students' navigation of disciplinary values in connection with their prior lived experiences, sense-making about disciplinary concepts and practices, critical considerations of power and privilege, and their own participation in the disciplinary domain. This work contributes 1) empirical examples of disciplinary values navigation as a process that includes students' interpretation of the multiplicity of values within a discipline and their consideration of how they and others might reshape those values through their disciplinary participation, and 2) understandings of how science learning spaces can be designed for students to critically navigate disciplinary values.

Session E 11

23 August 2023 12:00 - 13:30
UOM_A08
Single Paper
Learning and Special Education, Teaching and Teacher Education

Differentiated Instruction

Keywords: In-service Teachers, Inclusive Education, Inquiry Learning, Science Education, Secondary Education, Self-concept, Social Interaction, Special Education, Teacher Professional Development, Teaching Approaches, Teaching/Instructional Strategies, Well-being
Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development, SIG 15 - Special Educational Needs, SIG 20 - Inquiry Learning
Chairperson: Alyssa Laureen Grecu, Germany

Preparing teachers for differentiating their instruction: A meta-analysis and a multiple-case study

Keywords: In-service Teachers, Inquiry Learning, Science Education, Teacher Professional Development

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Since elementary school children highly differ in their science domain knowledge and skills, differentiated instruction can be a promising instructional approach to respond to these individual differences. Teachers are open for differentiated instruction, but need support to implement it, possibly in the form of professional

development programs (PD programs). Inquiry-based science lessons might be a particularly inviting context to implement differentiated instruction because of the flexibility in the level of guidance. The aim of the current paper is twofold. First, we provide an overview on the effects of PD programs on teachers' implementation of differentiated instruction and students' learning outcomes, so far. Second, we inventory which aspects of differentiated instruction teachers already implement inquiry-based science lessons and in which aspects they might benefit from professional development. For the first aim, we conducted a meta-analysis of 27 studies that tested the effects of PD programs on teachers' differentiation practices and student learning. The results showed that PD programs increased teachers' implementation of differentiated instruction, but had no significant mean effect on students' learning outcomes. For the second aim, we conducted a multiple-case study. Specifically, we interviewed and observed 10 elementary school teachers for an inquiry-based science lesson. Preliminary results show that while the teachers already applied differentiated instruction to some degree, they could still benefit from PD programs regarding some aspects, like monitoring children's skills and knowledge. Outcomes of these two studies will inform the design of a PD program on differentiated instruction in the context of inquiry-based science education.

Teacher programs for differentiated instruction: a review study
Keywords: Inclusive Education, Secondary Education, Teacher Professional Development, Teaching Approaches
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To gain more insight into the organization of effective teacher training for DI, a systematic qualitative review study was conducted of 29 peer-reviewed articles from 2010-2020. The articles reported on interventions (teacher training programs) targeted at improving teachers' competence for tailoring the diverse learning needs of their students. This review identified the relevant DI content characteristics, explored the extent to which DI learning interventions work (or do not work), and explored how environmental circumstances, such as school context and teacher characteristics, interplay with the interventions' effects.Differentiated instruction (DI) is an approach to teaching aimed at meeting student differences. DI is considered an important but complex teaching competence. Therefore, training (future) teachers for DI is important, and the development and redesign of teacher education curricula are desirable. The findings indicate that to be relevant and effective, a DI program is ideally longitudinal and comprehensive, and addresses attitudes, knowledge, and skills. Attitudinal change is considered a prerequisite for effectively applying DI and the importance of a facilitative intervention context is emphasized. With respect to program characteristics; active learning, collaborative practice and reflective practice support positive outcomes. The findings underscore the relevance of attention to DI learning for both preservice and inservice teachers.

Differentiated students or differentiated instruction?
Keywords: Inclusive Education, Special Education, Teaching Approaches, Teaching/Instructional Strategies
Presenting Author:Sérgio Gaitas, ISPA-Instituto Universitário / CIE - ISPA (Center for Research in Education), Portugal

Differentiated instruction (DI) is a widely addressed concept and has been proposed as an approach to address student diversity and develop inclusive educational systems. DI is considered a flexible approach to teaching that offers adequate challenges and appropriate scaffolding to all students in the context of heterogeneous classrooms. However, despite DI being a well-known approach, recent reviews have drawn attention to the misconceptions around the concept, from individualization to the teaching of specific groups of students. Considering the worldwide misconceptions and the limited studies describing the teachers' daily practices of DI, this study aimed to characterise teaching practices under the concept of DI. Thirty-nine teachers self-reported a DI strategy that they usually develop. The main findings suggest that the teachers' reported practices are based on an ability streaming approach or directed to students with disabilities and are typically mobilized when students cannot do the same activity as the other pupils. These results revealed major discrepancies between the practice and the intended goal of DI. In fact, what is being enacted in the name of DI has become ambiguous.

Can differentiated instruction support students' socio-emotional variables?
Keywords: Inclusive Education, Self-concept, Social Interaction, Well-being
Presenting Author: Marcela Gerardina Pozas Guajardo, Profesional School of Education, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Verena Letzel, University of Trier, Germany

In consideration of the substantial increase in students' learning demands, teachers are urged to address student heterogeneity in their daily teaching practice by means of differentiated instruction (DI). The practice of DI, as a vehicle to achieve inclusive education, not only aims to support all students' academic learning but also foster their social and emotional development. However, current research in the field of DI has mostly been limited to an examination of its effects on students' achievement outcomes. Consequently, the potential impact of DI on students' socio-emotional outcomes has, up until now, received very little attention. In order to address this gap in the research, the current study sought to investigate the effects of DI on students' emotional well-being, social inclusion and academic self-concept. Survey participants in this study included 602 lower secondary school students from 25 inclusive and regular classes in secondary schools in Mexico. Following multilevel analyses, surprisingly, the results have indicated that students' rating of their teachers' DI practice was not positively associated with their emotional well-being, social inclusion and academic self-concept. A further t-test for dependent samples demonstrated that students perceive their teachers' DI practice to be quite seldom.

Session E 12

23 August 2023 12:00 - 13:30
AUTH_DC1
Single Paper
Learning and Instructional Technology, Motivational, Social and Affective Processes

Student and Teacher Growth Mindsets

Keywords: Emotion and Affect, Engagement, Large-scale Assessment, Mindsets, Motivation, Multimedia Learning, Primary Education, Quantitative Methods, Video-based Learning, Writing/Literacy
Interest group: SIG 06 - Instructional Design, SIG 08 - Motivation and Emotion
Chairperson: Debra Myhill, University of Exeter, United Kingdom

The rich gets richer: Growth mindsets matter more in affluent contexts
Keywords: Engagement, Large-scale Assessment, Mindsets, Motivation
Presenting Author: Ronnel Bornasal King, The Chinese University of Hong Kong, Hong Kong; **Co-Author:**Faming Wang, The Univerisity of Hong Kong, Hong Kong; **Co-Author:**Shing On Leung, The University of Macau, Macao; **Co-Author:**Andrew Elliot, University of Rochester, United States

There is a heated debate about how socio-economic contexts interact with growth mindsets in predicting learning-related outcomes. However, past studies were beset by the small sample size and mostly focused on family SES. In this study, we adopted a large nationally representative sample to explore how family SES, school SES, and country affluence moderated the effect of students' growth mindset on academic achievement, intrinsic motivation, and academic engagement. Multilevel moderated analyses were conducted to analyze the Programme for International Student Assessment (PISA) 2018 database with 612,004 students from 80 countries. Results indicated that having a growth mindset was positively associated with academic achievement, intrinsic motivation, and academic engagement. Meanwhile, the effect of growth mindset on academic achievement, intrinsic motivation, and academic engagement was moderated by socio-economic contexts. Students from affluent families, schools, and countries benefited more from the growth mindset. This study shows the "rich gets richer" phenomenon and highlights the importance of considering the interplay between socio-economic contexts and growth mindset in understanding academic achievement, intrinsic motivation, and academic engagement.

The effects of growth mindset and emotions on L2 writing performance

Keywords: Emotion and Affect, Mindsets, Quantitative Methods, Writing/Literacy
Presenting Author:JIAHUAN ZHANG, The University of Hong Kong, China; **Co-Author:**Choo Mui Cheong, The University of Hong Kong, Hong Kong; **Co-Author:**Yuan Yao, The Hong Kong Polytechnic University, Hong Kong; **Co-Author:**Xinhua Zhu, The Hong Kong Polytechnic University, Hong Kong

Growth mindset (GM), defined as an individual's perception that intelligence is malleable, has caught increasing attention in educational research. GM often leads to positive learning emotions and facilitates learning in many contexts. Several studies have investigated the relationship between GM and learning emotions in second language (L2) contexts, with limited discussion in L2 writing that entails more effort than other language learning domains. Additionally, writers with different writing proficiency levels showed different impacts of writing mindset and emotions on writing performance separately, but these two have not been researched together thus far. Therefore, taking a step further, this study investigated the effects of growth mindset and L2 writing emotions (enjoyment and anxiety) on L2 writing performance. Participants were 589 Chinese twelfth-graders who were learning English as their L2 in mainland China. Results showed that GM was positively associated with enjoyment and negatively with anxiety. When examining GM-emotions relationships as per writing proficiency levels (high, middle, low), there were intriguing group differences. There was an indirect positive path from GM to writing performance via anxiety in the middle-level group; and an indirect positive path via enjoyment in the low-level group. Findings suggested that the endorsement of GM can effectively modulate writing emotions, which further enhances writing performance. Pedagogical implications include fostering GM and proliferation of social-emotional learning are discussed.

How growth mindsets induced by a pedagogical agent can foster learning in primary school
Keywords: Mindsets, Multimedia Learning, Primary Education, Video-based Learning
Presenting Author: Konstantinos Michos, University of Zurich, Institute of Education, Switzerland; **Co-Author:**Sascha Schneider, University of Zurich, Switzerland; **Co-Author:**Kate Xu, Open Universiteit Nederland, Netherlands

Studies have shown that an induction of a growth mindset has a positive effect on learning performance, intrinsic motivation, lowered perceived difficulty, and mental effort. This study investigates whether the presence of a pedagogical agent in digital learning media can boost this effect for primary school students. This was investigated using a learning video on the topic "deep sea" with a total of 149 primary school pupils randomly assigned to the four experimental conditions of a 2 (growth mindset vs. fixed mindset induction) x 2 (pedagogical agent vs. no pedagogical agent) factorial design. The results show that (a) the group with an induced growth mindset achieved better learning performance and reported lower perceived difficulty than the group with an induced fixed mindset, (b) the presence of the pedagogical agent led to higher scores in intrinsic motivation, lower scores in perceived difficulty, and more mental more mental effort, and (c) the positive effects of an induced growth mindset on learning performance and perceived difficulty was increased with a pedagogical agent. These results suggest the use of pedagogical agents to effectively incorporate a growth mindset induction into primary school students' learning activities.

Session E 13

23 August 2023 12:00 - 13:30
UOM_A11
Single Paper
Higher Education

Curriculum Development in Higher Education

Keywords: Competencies, Cooperative/Collaborative Learning, Curriculum Development, Engagement, Higher Education, Inquiry Learning, Meta-analysis, Qualitative Methods, Synergies between Learning / Teaching and Research, Teaching Approaches, Teaching/Instructional Strategies
Interest group: SIG 04 - Higher Education
Chairperson: Eric Schoute, University of Maryland, United States

Examining a 'throughline' in research-based curricula by researcher-student collaborative inquiries
Keywords: Curriculum Development, Higher Education, Inquiry Learning, Qualitative Methods
Presenting Author: Tracy Zou, The Chinese University of Hong Kong, Hong Kong; **Co-Author:**Tom Barry, University of Bath, United Kingdom; **Co-Author:**Ka Sing Yu, The University of Hong Kong, Hong Kong; **Co-Author:**Jetty C. Y. Lee, The University of Hong Kong, Hong Kong; **Co-Author:**King L. Chow, The Hong Kong University of Science and Technology, Hong Kong; **Co-Author:**Lily Y. Y. Leung, The Chinese University of Hong Kong, Hong Kong

A research-based curriculum prepares students for dealing with unforeseen problems in an uncertain world. Scholars increasingly advocate for a connected curriculum embedding a 'throughline' that develops students' inquiry capacity gradually throughout their years of study. However, implementing such a connected curriculum is challenging. This multiple-case study examined how the research-based curriculum was perceived by teachers and experienced by students in three science and one interdisciplinary undergraduate programmes. Data were collected from documents, teacher and student interviews, and researcher-student collaborative analyses. The findings identified a 'throughline' conceptualised differently by teachers and students. Students viewed mentoring, peer support, and opportunities outside of the curriculum as part of the 'throughline', whilst faculty members focused more on the formal curriculum. The implications are to develop a holistic view of the curriculum with formal and informal support to students.

Unraveling research competence for professionals: a concept analysis based on a systematic review.
Keywords: Competencies, Curriculum Development, Higher Education, Synergies between Learning / Teaching and Research
Presenting Author: Lisette Munneke, Utrecht University of Applied Sciences, Netherlands; **Co-Author:**Pieter Schilder, HU University of Applied Sciences Utrecht, Netherlands; **Co-Author:**Belinda Ommering, Utrecht University of Applied Sciences, Netherlands; **Co-Author:**Daan Andriessen, Utrecht Univesity of Applied Sciences, Netherlands

As a result of ambiguity in defining research competence for professional contexts, implementing research competence in curricula within higher professional education (HPE) is challenging. This might hinder the motivation of upcoming professionals to use research competence in their daily practices, while this is important to deal with the growing complexity in these practices. Therefore, in this contribution the variety of interpretations of the concept of research competence for professional contexts is reviewed to come to a clear and unambiguous definition of the concept which helps to shape and implement research more effectively in curricula of HPE. With help of the Conceptual Analysis Method, we identified the terms used for the phenomenon of professionals doing research in and for their own practices. Following this, we analyzed the definitions given in different domains and communities of research. Findings indicate a distinction in a holistic and analytic approach, with little to no attention regarding possible differences between the research competence needed in professional contexts and more academic contexts. Based on these results we propose a holistic definition grasping the core ideas of this competence. The professional with research competence should be able to 1) recognize and acknowledge where adequate actionable knowledge is lacking in the professional context, 2) make substantiated decisions on how to deal with these knowledge gaps, 3) answer research questions in a systematic manner with a rigor that is appropriate within the given context, and 4) make the results useful for specific professional situations in dialogue with stakeholders.

Co-creation and student-staff partnership in higher education. A scoping review
Keywords: Cooperative/Collaborative Learning, Curriculum Development, Engagement, Higher Education
Presenting Author: Maren Omland, Oslo Metropolitan University, Norway; **Presenting Author:**Frederick A. Reiersen, Oslo Metropolitan University, Norway; **Presenting Author:**Anja Amundrud, University of Oslo, Norway; **Co-Author:**Hege Hermansen, Oslo Metropolitan University, Norway; **Co-Author:**Magnus Hontvedt, University of South East Norway, Norway

In this paper, we conduct a review of existing research on the involvement of students in the development of teaching and learning in higher education. Such student-staff collaboration is referred to here as *co-creation*. Several studies suggest that co-creation in higher education has several potential benefits, such as reduced dropout, increased academic performance, increased student engagement and improved equity. Co-creation can also be a tool for supporting student agency and well-being in times characterized by uncertainty, political turmoil and environmental crisis. By engaging students as agentic partners in their own

educational trajectories, we can create opportunities for students to shape teaching and learning in higher education and increase their sense of belonging. However, the existing literature demonstrates a considerable variety in how co-creation is conceptualized and enacted. This review systematizes this knowledge and examines factors that may encourage or discourse co-creation activities in higher education. Based on systematic searches in the data bases Scopus, Web of Science and Eric, we identified 180 articles that fit our inclusion criteria. We examine how co-creation is conceptualized and operationalized, the advantages and challenges associated with co-creation, and key recommendations for implementing co-creation activities in higher education. The analysis is currently ongoing, but preliminary findings suggest that co-creation activities can foster student engagement and agency and lead to higher retention rates and increased student performance. However, little research describes successful approaches for how best to implement such activities, and there are few theoretically based explanations on how and why such activities may be successful.

Preparing students for peer-led education and their outcomes: A systematic literature review
Keywords: Higher Education, Meta-analysis, Teaching Approaches, Teaching/Instructional Strategies
Presenting Author: Marieke Thurlings, Eindhoven University of Technology, Netherlands; **Co-Author:**Gerdienke Reijmers, Universiteit Utrecht, Netherlands; **Co-Author:**Karline Timmers, Universiteit van Amsterdam, Netherlands; **Co-Author:**Jan van der Veen, Eindhoven School of Education, Netherlands; **Co-Author:**Pieter de Bordes, Universiteit Utrecht, Netherlands

To prepare students to peer-lead education, they need to be trained. This systematic literature review aims to describe training programs for peer-leading students and evaluate outcomes for these students. It also aims to evaluate learning outcomes for students that participate in the peer-led education. Finally, it aims to evaluate beliefs of the teaching staff that is involved, on the training programs and the peer-led education. Based on an extensive search and eligibility criteria, 86 studies were included. Preliminary findings show that both groups of students are satisfied and have positive learning outcomes. Studies are mostly of descriptive nature. This calls for collaboration between educationalists, educational researchers, and those developing and evaluating training students for peer-led education.

Session E 14

23 August 2023 12:00 - 13:30
UOM_A07
Single Paper
Instructional Design, Learning and Instructional Technology, Learning and Social Interaction

Example- and Problem-based Learning

Keywords: Citizenship Education, Example-based Learning, Feedback, Inquiry Learning, Instructional Design, Learning Approaches, Learning Strategies, Meta-analysis, Misconceptions, Peer Interaction, Problem Solving, Problem-based Learning
Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 10 - Social Interaction in Learning and Instruction
Chairperson: Ellen Claes, KU LEUVEN, Belgium

A Systematic Review on Erroneous Examples
Keywords: Example-based Learning, Instructional Design, Learning Approaches, Meta-analysis
Presenting Author: Marc Rodemer, University of Duisburg-Essen, Germany; **Co-Author:**Sonja Dieterich, University of Duisburg-Essen, Germany; **Co-Author:**Stefan Rumann, University of Duisburg-Essen, Germany

Erroneous examples as a particular form of worked examples emphasize wrong answers or solution steps in instruction. We present a systematic literature review summarizing empirical evidence concerning the effectiveness of erroneous examples on learning. Overall, 25 out of 36 studies report positive effects on learning outcomes. While most studies appeared in mathematics or medicine, only few other domains are reported. Conditions for the effectiveness of erroneous examples are different prompts in the learning material or types of feedback that are influenced by prior knowledge and cognitive load. Our review calls for more systematic research on the educational conditions under which erroneous examples are beneficial for learning.

Correct or erroneous examples first? Effects of the order of different example types on learning
Keywords: Example-based Learning, Instructional Design, Misconceptions, Problem Solving
Presenting Author: Lukas Wesenberg, Chemnitz University of Technology, Institute for Media Research, Germany; **Co-Author:**Felix Krieglstein, Chemnitz University of Technology, Germany; **Co-Author:**Sebastian Jansen, Chemnitz University of Technology, Faculty of Humanities, Institute for Media Research, Germany; **Co-Author:**Günter Daniel Rey, Chemnitz University of Technology, Germany; **Co-Author:**Maik Beege, University of Education Freiburg, Germany; **Co-Author:**Sascha Schneider, University of Zurich, Institute of Education, Germany

Correct but also erroneous worked examples are both frequently used instructional methods to foster students' learning performance, especially in problem-solving. However, no study has yet examined how the order of these example types affects learning. While the expertise reversal effect would suggest presenting correct examples first, the productive failure approach hypothesizes the reversed order to be learning-facilitating. In addition, the congruency of subsequent exemplified problems was tested as a moderator. For example, with arithmetic tasks, congruent problems target exactly the same calculation while incongruent problems refer to different calculations. To test the (conflicting) hypotheses, 83 university students were assigned to one of the four conditions in a 2 (correct vs. erroneous example first) × 2 (same vs. different exemplified problems) between-subject design. Although no main or interaction effects were found regarding students' learning performance, mediational analysis offered support for the expertise reversal effect, as it indicated that there is an indirect effect of order via mental load on learning. Presenting correct examples first and erroneous examples second resulted in a lower mental load, which in turn was associated with better learning performance. These findings offer first insights into the question of how the presentation order of different example types impacts learning and provide practical recommendations for the design of educational media.

Students' navigation in an open-ended project addressing democracy and citizenship
Keywords: Citizenship Education, Inquiry Learning, Peer Interaction, Problem-based Learning
Presenting Author: Anniken Furberg, University of Oslo, Norway; **Co-Author:**Sigrid Ernstsen, Department of Teacher Education and School Research, University of Oslo, Norway; **Co-Author:**Kari Anne Rødnes, University of Oslo, Norway

In this study, we investigate how a class of upper secondary school students navigated in an open-ended project addressing democracy and citizenship. This setting involved a complex theme, self-organized inquiry, peer collaboration, making of products and the use of various sources with little scaffolding from teachers and disciplinary norms. We take a sociocultural approach to explore how the students made sense of the theme, how they regulated their work process and how they related to each other socially during their engagement. We analyse video recordings of all classroom interactions from the project, including an analytical focus on the products that the students made. Our results show that the students in their sensemaking looked up information and inspiration using the internet where they mainly relied on online encyclopedia sources and image-based social networks. To solve the assignment, they were concerned with distributing tasks, coping facts and images, and decorating their product contributions. Furthermore, the students related to each other by gathering in social groups where they negotiated and included each other's contributions and opinions. In addition, they made products that highlighted their class relations. We argue that the way the students navigated in the project is valuable, as they encountered opportunities to practice democratic principles. However, our study clarify the important role of the teacher in supporting students in their sensemaking, work processes and relational work as they engage in complex projects.

Effects of Prior Instruction and Feedback on Students' Learning
Keywords: Example-based Learning, Feedback, Instructional Design, Learning Strategies
Presenting Author: Salome Wagner, University of Tübingen, Germany; **Co-Author:**Leonie Sibley, University of Tübingen, Germany; **Co-Author:**David Weiler, University of Tübingen, Germany; **Co-Author:**Jan-Philipp Burde, University of Tübingen, Germany; **Co-Author:**Katharina Scheiter, University of Potsdam, Germany; **Co-Author:**Andreas Lachner, University of Tübingen, Germany

Instruction and feedback are powerful strategies to enhance learning. However, it is still unclear whether combining instruction and feedback aids learning. We conducted three online experiments (N_1 = 439, N_2 = 310, N_3 = 166) investigating potential interaction effects of prior instruction and feedback. In Experiment 1 and 2, we crossed two factors: prior instruction (direct vs. control) and feedback (yes vs. no). In Experiment 1, we replicated previous findings, as the combination of instruction and feedback did not lead to additive effects and the effectiveness of instruction was significantly reduced once feedback was provided. This interaction could be explained by the level of arousal, particularly for low-performers. In Experiment 2, we could not replicate this effect with more elaborative feedback. Instead, we found a differential pattern, that is a main effect of prior instruction on far transfer and a main effect of feedback on near transfer. In Experiment 3, we investigated whether the sequence (feedback à instruction vs. instruction à feedback) affected the findings. Results demonstrated that the sequence in which the strategies were provided did not matter. Together, our findings refute the belief that combining direct instruction and feedback provides additional support for learning.

Session E 15

23 August 2023 12:00 - 13:30
UOM_A05
Single Paper
Higher Education, Learning and Social Interaction, Teaching and Teacher Education

Cooperative Learning, Social and Motivational Processes

Keywords: Communities of Learners and/or Practice, Cooperative/Collaborative Learning, Developmental Processes, Higher Education, In-service Teachers, Learning Strategies, Mixed-method Research, Motivation, Qualitative Methods, Science Education, Self-determination, Teaching Approaches
Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development
Chairperson: Francisco Peixoto, Portugal

Cooperative Learning in the classroom - A mixed methods study on the quality of implementation
Keywords: Cooperative/Collaborative Learning, In-service Teachers, Mixed-method Research, Teaching Approaches
Presenting Author: Vanessa A. Völlinger, Justus-Liebig-Universität Giessen, Germany; **Co-Author:**Katja Adl-Amini, TU Darmstadt, Germany; **Co-Author:**Agnes Eckart, Justus-Liebig-University Giessen, Germany

The positive effects of cooperative learning (CL) have been extensively documented. Thereby the question of how teachers implement CL methods is not trivial, as designing CL sequences places complex demands on teachers and the quality of implementation is supposed to be significantly related to the effectiveness of the methods. The present study used an explanatory mixed-methods design with sequential phases (quantitative-qualitative). An observation scale including indicators of the basic elements of CL as well as interviews and the analysis by thematical coding were used to analyse and explain the implementation of CL in 30 German classrooms. The quality of the observed CL lessons was rather low. Even the two most important elements of group goals and individual accountability, were only implemented in 17% of the lessons observed. Results of the qualitative analysis show a thematic pattern with differences between teachers with high and low implementation fidelity concerning the perception of the social learning and the responsibility for success of CL.

Solitary Practice and Band Rehearsals: Design and Strategy Use Regarding the Professional Level
Keywords: Cooperative/Collaborative Learning, Developmental Processes, Learning Strategies, Mixed-method Research
Presenting Author: Simon Schmidt, Universität Regensburg, Germany; **Co-Author:**Hans Gruber, University of Regensburg, Germany

Previous research on music practice mostly focused on individual practice. In particular, deliberate practice showed to be a reliable determinant of music performance. Much less is known about the importance of collective (deliberate) practice. A mixed method study is reported which addresses the interplay of individual and collective practice in a sample of N = 67 members of pop music bands. Both forms of practice and their relation were assessed with a questionnaire and with a semi-structured interview. Practice patterns of participants at two professional levels of musicians (semi-professionals, professionals) were investigated in order to trace differences with regard to the use of strategies and the appearance of deliberate practice in both practice contexts. Results indicate that professionals, compared to semi-professionals, invest more time in individual practice and work more goal-driven in collective practice. The use of individual and collective practice strategies does not clearly differ in terms of professional level. Individual and collective practice seem to be interrelated. In the discussion, the role of inter-individual relations in group processes is elaborated. Conclusions are drawn about the development of expert music performance in general.

Exploring the Enactment of Open-Schooling Projects and their Impact on Students' Self-Determination
Keywords: Communities of Learners and/or Practice, Qualitative Methods, Science Education, Self-determination
Presenting Author: Yvoni Pavlou, University of Cyprus, Cyprus; **Co-Author:**Marios Papaevripidou, University of Cyprus, Cyprus; **Co-Author:**Georgia Kouti, University of Cyprus, Cyprus; **Co-Author:**Marilena Savva, University of Cyprus, Cyprus; **Co-Author:**Pavlos Koulouris, Ellinogermaniki Agogi, Greece; **Co-Author:**Zacharias Zacharia, University of Cyprus, Cyprus

Open Schooling (OS) is a promising approach in fostering the interaction and collaboration among schools and external stakeholders and in facilitating students' learning through their active engagement in OS projects. This study aims at exploring how OS was employed by schools during an academic school year and whether students' engagement in OS projects impacted their self-determination. 40 schools, 80 teachers affiliated with these schools, and 330 students participated in this study. OS project reports that were created by each participating school and students' completed questionnaires served as the study's data, which were analyzed both qualitatively and quantitatively. Five pathways emerged from the analyses depicting the actions and emerged outputs associated with the school projects. The pathways differentiated in terms of either the sequence of actions and deriving outcomes followed during the planning phase of the projects or the presence/absence of stakeholders' contribution in specific actions/outputs. Only students whose project followed a specific pathway appeared to have developed their self-determination significantly. The findings can contribute towards improving the methodology of the European-funded project that the present study was conducted in the context of which, and for making informed recommendations for future relevant initiatives.

Fostering students' autonomous motivation with a societal impact project
Keywords: Cooperative/Collaborative Learning, Higher Education, Motivation, Self-determination
Presenting Author: Yuanyuan Zhu, Maastricht University, FHML, Dept. of Educational Research and Development, Netherlands; **Co-Author:**Diana Dolmans, Maastricht University, Netherlands; **Co-Author:**Rashmi Kusurkar, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Leo Koehler, Maastricht Uiversity, Faculty of Health, Medicine and Life Sciences, Netherlands; **Co-Author:**Latifa Abidi, Maastricht Uiversity, Faculty of Health, Medicine and Life Sciences, Netherlands; **Co-Author:**Hans Savelberg, Maastricht Uiversity, Faculty of Health, Medicine and Life Sciences, Netherlands

Background: Autonomous motivation (AM) is crucial for university students since it is positively related to higher academic performances[1], intention to continue studies[2], and improved well-being[3]. Self-determination theory poses that learning environments with characteristics that support basic psychological needs facilitate AM. We created a so-called societal impact project with basic psychological needs supportive elements such as freedom to choose projects, coach and group support, and creative presentations. This study investigated the effect of the project on students' AM for their study programmes and explored their experience in the project.Methods: Students voluntarily registered in either a control or an intervention group. Control-group students followed their regular programme, intervention-group students participated in an extracurricular societal impact project next to the regular programme. All students filled out a survey in the beginning and the end of the project, measuring their basic psychological needs, AM, enjoyment and usefulness of their study programme, and well-being. Focus groups were conducted with intervention-group students at the end of the project. Results: 1) Although there was no significant difference of students' scores of the variables between the two groups at the end, intervention-group students rated their study programme significantly more enjoyable, interesting, and valuable; 2) Students' AM and well-being were significantly lower as compared to the beginning of the project in both groups; 3) Intervention-group students

linked the project experience with the basic psychological needs and described it helpful to see the value of their study and showed willingness to continue the project. Key words: Motivation, Self-determination, Curriculum development

Session E 16

23 August 2023 12:00 - 13:30
AUTH_T102
Single Paper
Learning and Social Interaction, Motivational, Social and Affective Processes, Teaching and Teacher Education

Gender, Motivation and STEM Choices

Keywords: Achievement, Attitudes and Beliefs, Developmental Processes, Emotion and Affect, Gender Issues, In-service Teachers, Motivation, Pre-service Teachers, Primary Education, Qualitative Methods, Quantitative Methods, Resilience, Science and STEM
Interest group: SIG 08 - Motivation and Emotion, SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Alla Hemi, Bar Ilan University, Israel

Perfectionism and Resilience: The role of Gender
Keywords: Attitudes and Beliefs, Emotion and Affect, Gender Issues, Resilience
Presenting Author: Athina Voulgari, Aristotle University of Thessaloniki, Greece; **Co-Author:**Susana Panteliadou, Aristotle University of Thessaloniki, Greece

Perfectionism is a multidimensional concept that has been examined as a personality trait and more recently in the context of social interaction. Perfectionism as a disposition consists of constant striving for perfection (which shows ambivalent relationships with maladjustment and in some cases can be adaptive) and constant concerns with mistakes and doubts about actions (which is maladaptive). Perfectionistic self-presentation is steadily related with maladjustment. Perfectionism as a personality trait and resilience have been co-examined in college students, showing that resilience can minimize the negative consequences of perfectionism on mental health dimensions and adjustment. Few studies have examined the relationships between the two constructs (perfectionism and resilience) and their dimensions in adolescent population. Moreover, no study examined possible relationships between perfectionistic self-presentation and resilience. The current study examines the relationship between perfectionism and resilience in adolescents. 119 students (11-15 years old) from schools of Thessaloniki completed questionnaires regarding perfectionism as a disposition, perfectionistic self-presentation and resilience. Perfectionism as a personality trait predicted perfectionistic self-presentation, as hypothesized. Significant gender differences where observed, the predictive value was far more powerful for girls than for boys. Perfectionism as a disposition predicted to a greater extent than perfectionistic self-presentation resilience, mostly the ability for emotional regulation. Gender differences were again observed. Boys and girls had similar scores regarding perfectionism, but boys had higher regarding resilience. Moreover, perfectionistic self-promotion predicted negatively resilience for girls, not for boys. The findings are discussed in the context of understanding challenges faced by adolescents nowadays, taking gender into account.

Primary-school students' motivational profiles and their connections with gender and achievement
Keywords: Achievement, Developmental Processes, Motivation, Primary Education
Presenting Author: Anna Rawlings, University of Jyväskylä, Finland; **Co-Author:**Kati Vasalampi, University of Jyväskylä, Finland

The present study aimed to identify among Finnish primary-school students (N = 1995) motivational profiles of task-avoidant and task-focused behaviours, and examine over three years their stability, development, and relationships with gender and arithmetic achievement. Students completed self-report questionnaires mapping their task-avoidance, challenge-enjoyment, competence-displaying, and fear of failure in the 2^{nd}, 3^{rd}, and 4^{th} grades. Time-constrained arithmetic tests administered each year were used as an indicator of achievement. Two-step cluster analysis was used to identify motivational-response profiles for each time point. Profile stability and change were examined with configural frequency analysis, the relationship between profile membership and gender with cross-tabulations, and the effects of profile membership on test achievement with one-way ANOVAs. Four motivational-response profiles were identified: *Adjusted* (high challenge-enjoyment, low task-avoidance, competence-displaying, and fear of failure); *Disinterested* (low challenge-enjoyment, high task-avoidance); *Worried* (high fear of failure, decreasing challenge-enjoyment, increasing task-avoidance); and *Competitive* (high competence-displaying, low levels of other variables). Regarding stability, 33.3% of participants remained in the same profile throughout, and a further 8.3% moved to another profile after t1, then remaining there for t2 and t3. Girls were over- and boys underrepresented in the Worried profile, and boys were over- and girls underrepresented in the Competitive profile. Overall, Adjusted students achieved better in the arithmetic test than others, and Competitive students better than Worried and Indifferent students. The findings suggest that an understanding of different motivational-response profiles and their dynamics, antecedents, and outcomes may be important for providing students with support suited to their individual needs.

How Aware Are Teachers Towards Math-gender Stereotype Reinforcing Behavior? A Video Experiment
Keywords: Attitudes and Beliefs, Gender Issues, In-service Teachers, Quantitative Methods
Presenting Author: Anna-Sophia Dersch, Justus-Liebig-Universität Gießen, Germany; **Co-Author:**Anke Heyder, Ruhr-University Bochum, Germany; **Co-Author:**Alexander Eitel, University of Giessen, Germany

Implicit and explicit stereotypes of girls having inherently lower math abilities remain prevalent among society and also teachers as powerful socializers. Such beliefs negatively influence female representation in math. A majority of female students report math-gender stereotypes – also expressed by teachers. Here, we researched teachers' awareness towards teacher behavior that reinforces math-gender stereotypes (*math-gender stereotype reinforcing behavior;* MGSRB). We staged and filmed four math lesson videos with a model teacher expressing implicit to explicit MGSRB. In an online experiment, we randomly assigned 289 participating teachers to a *male* or *female* model teacher expressing MGSRB and instructed them to evaluate their teaching behavior. Very few teachers were aware towards implicit MGSRB, most were aware towards explicit MGSRB. Teachers were more aware towards the male model teachers' MGSRB than towards the female model teacher's MGSRB, $F(1, 272) = 23.06$ $p < .001$, $\eta^2 = .078$. Model-observer gender-similarity improved awareness, $F(1,272) = 4.97$, $p = .027$, $\eta^2 = .018$. Awareness was weakly correlated with explicit math-gender stereotypes. The findings call for teacher trainings improving teachers' awareness towards MGSRB.

Why do they pursue a major in math and science?: Female preservice teachers' perspective
Keywords: Gender Issues, Pre-service Teachers, Qualitative Methods, Science and STEM
Presenting Author: Gamze İnan, Boğaziçi University, Faculty of Education, Turkiye; **Co-Author:**İrfan Erdoğan, Bogazici University, Turkiye

To better understand gender disparity in education and promote equal representation of females in mathematics and science careers, it would be helpful to investigate how women who have already chosen a teaching major in these fields perceive their own earlier school years. That is, examining how they made their choices, how their choices were influenced by gender stereotypes in these fields, and how their views would affect their future students' career choices deserve attention. In this qualitative study, we examined the experiences of female preservice teachers from the fields of mathematics and science, focused to understand how they chose their major, and how they perceived the role of gender in education in these fields. In-depth semi-structured interviews lasting approximately 45 minutes were conducted, transcribed verbatim, and thematically analyzed with qualitative analysis software. The study showed that female preservice teachers choose careers based on their earlier experiences in math and science classrooms.

Session E 17

23 August 2023 12:00 - 13:30
AUTH_T202
Single Paper
Assessment and Evaluation, Learning and Special Education, Motivational, Social and Affective Processes, Teaching and Teacher Education

Learning during COVID-19

Keywords: Achievement, Anxiety and Stress, At-risk Students, Digital Literacy and Learning, Mixed-method Research, Pandemic, Primary Education, Quantitative Methods, School Effectiveness, Secondary Education, Social Interaction, Writing/Literacy
Interest group: SIG 01 - Assessment and Evaluation, SIG 11 - Teaching and Teacher Education, SIG 12 - Writing, SIG 15 - Special Educational Needs
Chairperson: Signe Pirkko Siklander, University of Oulu, Finland, Finland

Inclusive school cultures and digital school development processes in Austria in times of COVID-19.
Keywords: Digital Literacy and Learning, Mixed-method Research, Pandemic, Primary Education
Presenting Author: Ricarda Derler, University of Graz, Austria; **Presenting Author:**Melina Tinnacher, University of Graz, Austria; **Co-Author:**Heike Wendt, University of Graz, Austria

The COVID-19 pandemic left autonomous schools in Austria to respond individually to common challenges. The In-DIG-developments project (University of Graz, Austria) investigated the impact and changes caused by COVID-19 in primary and secondary schools in Styria (Austria) with a particular focus on inclusive and digital educational settings. The study was conducted in a mixed methods design with a quantitative survey for students, teachers, principals and parents, followed by interviews. This contribution focuses on pandemic related school development and therefore surveys of primary school principals (n=18) and interviews with principals of small schools (n=8) have been taken into account. Results show that all primary schools in Styria were provided differently with personal and digital resources. A multivariate regression showed that primary schools without inclusion classes advanced significantly more in the area of digitization compared to schools with inclusion classes or small schools. Negative effects on student well-being and subject learning were significantly less of a concern for principals of small schools than for principals of regular primary schools. Small schools were significantly more likely to provide services for students with special needs or in need of support and paid more attention to educational equity in distance learning. The contribution of this study is to identify which indicators support a digitization process in inclusive school culture in Austria's primary schools on different levels of school development.

Differential Effects of COVID-19 School Closures on Students' Achievement
Keywords: Achievement, Quantitative Methods, School Effectiveness, Secondary Education
Presenting Author: Tim Fütterer, University of Tübingen, Germany; **Co-Author:**Tony Tan, University of Oslo, Norway; **Co-Author:**Rolf Vegar Olsen, University of Oslo, Norway; **Co-Author:**Astrid Marie Jorde Sandsør, University of Oslo, Norway; **Co-Author:**Sigrid Blömeke, University of Oslo, Norway

School closures resultant from the COVID-19 pandemic represented a sudden and unexpected disruption of students' learning (Thorn & Vincent-Lancrin, 2021). Findings from previous studies suggest that school closures may have had a negative effect on student achievement, especially for students with low socioeconomic status (SES; Hammerstein et al., 2021). Although these findings appeared robust as many studies examined large samples and employed methods enabling causal inferences (e.g., difference-in-difference [DiD]; Engzell et al., 2021), many studies contained weaknesses in their underlying data. For instance, convenience samples were used (e.g., Clark et al., 2021), data were not representative (e.g., Kuhfeld et al., 2020), or data were obtained from survey methods such as web-based surveys result in distorted samples and/or low response rates (e.g., van der Velde et al., 2021). Moreover, studies were limited to a selected number of countries and detailed insights into differential effects are scarce (e.g., only self-reported proxies of students' socioeconomic status [SES], lack of information about student's migration background). We gain insight into such differential effects of COVID-19 school closures on students' reading and math learning progression by using longitudinal data of more than *N*=369.000 Year 8 and 9 Norwegian students. Preliminary findings fromDiD analyses indicate that differences of students' learning progression during COVID-19 to previous cohorts are negligible. Students with higher SES and students who do have an immigrant status were less affected than students with lower SES or a nonimmigrant status (0.11

Educational interventions for improving literacy to Greek primary school students during COVID-19
Keywords: At-risk Students, Pandemic, Primary Education, Writing/Literacy
Presenting Author: Styliani Tsesmeli, University of Patras, Department of Educational Studies and Social Work, Greece; **Co-Author:**Ioanna Skarmoutsou, University of Patras, Department of Educational Studies and Social Work, Greece

AbstractThe aim of the study was to assess a scientifically based educational intervention of literacy designed to support the inclusion of children with literacy difficulties (i.e., poor readers/spellers). The study was implemented in regular primary school classes in Greece before and during the COVID-19 pandemic. Participants were 72 students following third and fourth grade of two primary schools, who were divided into two intervention and two control groups. All students were assessed via standardized and non-standardized tests of intelligence, literacy and language tasks before the pandemic. The intervention took place via e-learning in the school classroom of the two experimental groups and included a pre-test, an educational program and a post-test. The experimental material comprised of complex words which pose particular difficulties to children in terms of spelling and meaning and their improvement assists considerably their vocabulary and reading comprehension. The results showed that the systematic exercise of the word structure increased significantly students' spelling and semantic performance which is essential for their subsequent academic progress. These findings underline the importance and the feasibility of implementing scientifically based educational interventions in inclusive education during COVID-19 pandemic. Theoretical and practical issues concerning the implementation of hybrid models of educational interventions and the transition to online learning are also discussed.

"Silent voices" in COVID-19: Students' experiences of wellbeing, learning, social relationships
Keywords: Anxiety and Stress, At-risk Students, Pandemic, Social Interaction
Presenting Author: Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Venla Panula, University of Jyväskylä, Finland; **Co-Author:**Noona Kiuru, University of Jyväskylä, Finland; **Co-Author:**Sanni Pöysä, University of Jyväskylä, Finland; **Co-Author:**Niina Junttila, University of Turku, Finland; **Co-Author:**Matilda Sorkkila, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

The present study examined students' experiences of well-being, learning, and social relationships during the COVID-19 pandemic. The data were collected via online questionnaires from 443 students (Mage = 17 years) living in Finland in spring 2022. The questionnaires included structured and open-ended questions. The cluster analysis was conducted, and six clusters were found: 1) students with increased well-being and eased learning (5%); 2) students with no big changes in well-being, learning, and experiences of loneliness (30%); 3) students with decreased well-being, increased loneliness, and more difficulties in learning (42%); 4) students with decreased well-being and more difficulties experienced in learning, but no big change in loneliness (13%); 5) students with decreased well-being and increased loneliness but no big change in learning (7%), and 6) students with decreased loneliness (3%). The findings indicated diversity in ways how students experienced the COVID-19 pandemic and related distance learning. The further analyses were conducted to examine the extent to which the clusters would differ with respect to students' reports of background factors, mood, loneliness, study burnout, and resilience. In addition, students' answers to open-ended questions were analyzed in each cluster. The findings provided important knowledge concerning how students have experienced the COVID-19 pandemic and related distance learning. These experiences are important to consider in any attempts to renew education.

Session E 18

23 August 2023 12:00 - 13:30
AUTH_TE2
Single Paper
Assessment and Evaluation, Educational Policy and Systems, Higher Education, Learning and Social Interaction

Minority and Migrant Students: Writing and Literacy

Keywords: Bilingual Education, Educational Policy, Feedback, Higher Education, L1/Standard Language Acquisition, Migrant / Refugee and Minority students, Multicultural Education, Secondary Education, Writing/Literacy
Interest group: SIG 12 - Writing, SIG 18 - Educational Effectiveness and Improvement, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Isabelle Krummenacher, Switzerland

How long does it take pupils to acquire Proficiency in English?
Keywords: Bilingual Education, Educational Policy, L1/Standard Language Acquisition, Migrant / Refugee and Minority students
Presenting Author: Steve Strand, University of Oxford, United Kingdom; **Co-Author:**Ariel Lindorff, University of Oxford, United Kingdom

This paper asks a central question for educators and policymakers: how long does it take for pupils new to English to acquire proficiency in English? This study reports on 5,453 EAL pupils who entered Reception class at age 4/5 in Wales between 2009 and 2011. We tracked these pupils over their subsequent six years in primary school (through Y1 to Y6). Every January the Proficiency in English (PIE) of the pupils was recorded by their teachers on a five-point scale, ranging from A (New to English) through to E (Fluent). We asked how long does it take for a majority (at least 50%) of pupils to make any specified transition? For pupils who entered Reception at A (New to English) over half (59%) had transitioned to B (Early Acquisition) by Y2,and over half (51%) had transitioned to C (Developing Competence) by Y4. However only one-third (31%) had transitioned to D/E (Competent/Fluent) by the end of Y6. Overall, by the end of Y6, nearly all (96%) transitioned to B (Early Acquisition), and over three-quarters (78%) transitioned to C (Developing Competence) but only around one-third (31%) transitioned to D/E (Competent/Fluent). This indicates that the majority of pupils starting Reception class New to English took more than six years to be rated as Competent/Fluent. This has significant implications for school funding in England, which provides targeted funding to EAL pupils for a three-year period after they join school, less than half the minimum suggested by our data for gaining academic proficiency.

Effects of feedback on writing: Differences between students with and without migration backgrounds
Keywords: Feedback, Migrant / Refugee and Minority students, Secondary Education, Writing/Literacy
Presenting Author: Nora Müller, Westfälische Wilhelms-Universität Münster, Germany; **Co-Author:**Vera Busse, Westfälische Wilhelms-Universität Münster, Germany; **Co-Author:**Till Utesch, Westfälische Wilhelms-Universität Münster, Germany

Although process-oriented writing instruction with feedback can support multilingual writers in particular, little is known about these practices and their influence on text quality. Therefore, this paper provides insights into writing and feedback practices and analyzes how these practices can account for writing differences, considering migration-related multilingualism and other background characteristics. Data from our sample of middle and lower-track secondary school students in Year 9 (N = 208; n = 106 students had a migration background) suggest that most of these students write texts in German class weekly; but they receive text feedback less often. Regarding frequency and quality of feedback, we found no differences in perception between students' groups. Results from regression analyses show that perceived general feedback quality (based on effective feedback criteria) and *feed forward* (i.e., specific advice on text development) predict a significant amount of the variance in text quality, while feedback frequency does not improve the model. Our findings underline the relevance of feedback for text quality, albeit it can be discussed to what extent feedback quality is more important than feedback quantity. Additional simple slope analyses show that students with migration backgrounds do not benefit from *feed forward*, when controlling for other background characteristics. While students with migration backgrounds particularly rely on feedback to support their writing, the *feed forward* presumably needs to be better adapted to their needs to be effective.

Hoping for linguistic diversity in academic writing
Keywords: Higher Education, Migrant / Refugee and Minority students, Multicultural Education, Writing/Literacy
Presenting Author: Ana Costa, University of Lisbon, Linguistics Center and Polytechnic Institute of Setúbal, Portugal

Migration within Portuguese-speaking countries in the last decades brought to the Portuguese higher education system students speaking and writing diverse intra-linguistic varieties, such as Brazilian Portuguese (BP) or different varieties from African countries (Angola, Cape Verde, or Guinea). Students from non-European regions perceive their own linguistic variety as a source of failure in writing and assessment contexts. The main goal of this study is to describe the linguistic and academic writing profile of 1st-year students from Portuguese-speaking countries in undergraduate courses at a higher education institution in Portugal. A linguistic and discourse analysis of writing essays provides evidence-based knowledge of students' writing strengths and weaknesses. The results highlight that problems affecting academic writing are independent of linguistic variety. Since it is not linguistic variation the main cause for inadequacy in academic essays, we hope these results will help teachers become more open to students' diversity in their scientific communication and empower all students with linguistic self-confidence.

Literacy and literacy didactics in the context of migration: A systematic literature review
Keywords: Bilingual Education, Migrant / Refugee and Minority students, Multicultural Education, Writing/Literacy
Presenting Author: Olga Kostoula, Private University of Education, Diocese Linz, Austria; **Co-Author:**Nicole Kronberger, Institute of Education and Psychology, Austria

Literacy and literacy didactics in the context of migration: A systematic literature review Migration movements increase globally and include notably forced migrants many of them children at school age. In educational contexts, migration entails cultural, emotional and language related disruptions that impact on learning behaviour. It is usually in connection with unvoluntary migration that the issue of emergent bilingualism gains attention as concepts and methods to teach linguistically divers and educationally heterogeneous classes lag behind contemporary demographic and educational developments. An issue of particular importance in this regard is the development of literacy. Literacy involves both linguistic and cognitive skills and represents a key construct for educational practice when learners bring with them experiences from different education systems or disruptions of their educational trajectories.The linguistic components of literacy are most obvious because they pertain to language understanding and speech production skills. Less is known about the cognitive components and their development in bi- or multilingual environments. The literature appears scattered across disciplines and this holds more true with regard to the question of how literacy relates to multilingualism. As a result, syntheses connecting the theoretical foundations of the concept to educational practice are scarce. The paper addresses these gaps following three steps: First, it reports the results of a systematic literature review on the concept of literacy in connection with migration and emergent bilingualism. Second, it categorises findings according to their cognitive and educational implications with particular consideration of multilingualism and third, it derives recommendations for further research.

Session E 19

23 August 2023 12:00 - 13:30
AUTH_DC3
Single Paper
Instructional Design, Learning and Instructional Technology

Comprehension of Text and Graphics through Multimedia Learning

Keywords: Comprehension of Text and Graphics, Computer-assisted Learning, Educational Technologies, Eye Tracking, Game-based Learning, Instructional Design, Multimedia Learning, Video-based Learning
Interest group: SIG 02 - Comprehension of Text and Graphics
Chairperson: Engin Ader, Bogazici University, Turkiye

How does seductive details combine with animated pictures influence students' learning?
Keywords: Comprehension of Text and Graphics, Educational Technologies, Instructional Design, Multimedia Learning
Presenting Author: Tiphaine Colliot, CeRCA UMR7295 Université de poitiers, France; **Co-Author:**Jean-Michel Boucheix, University of Dijon, LEAD-CNRS, France

The purpose of this study was to test the effects of static pictures versus animated pictures on students' performance in a paper-folding task in a naturalistic environment. This study also assessed the effects of seductive details on students' achievement. Seventy-two 2^{nd}-3^{rd} grade children participated in the present study. Results showed that animated pictures significantly improved students' performance and reduced the time spent to perform the task. No difference was obtained regarding students' perception of the easiness of the task. Moreover, results demonstrated no effects of seductive details on students' achievement. Seductive details even significantly decreased students' interest in the task.

Mapping processing and comprehension in learning from video combining trace and recall data.
Keywords: Comprehension of Text and Graphics, Computer-assisted Learning, Multimedia Learning, Video-based Learning
Presenting Author: Marijn Gijsen, University of Antwerp, Belgium; **Co-Author:**David Gijbels, University of Antwerp, Belgium; **Co-Author:**Sven De Maeyer, Antwerp University, Belgium; **Co-Author:**Leen Catrysse, Open Universiteit, Department of Online Learning and Instruction, Belgium

Up until now, empirical studies investigating learning from video have mainly compared the processing that occurs to the processing of (digital) texts. Less studies have focussed on how students differ in their processing of videos and how these differences relate to differences in learning outcomes, with most of this research relying on the use of self-report instruments such as retrospective annotations. This study aims at extending the current research on learning from video by combining quantitative measures in the form of trace-data with qualitative data from a cued-retrospective recall to map differences in cognitive levels of processing while learning from video and link those differences to learning outcomes in the form of a multi-layered post-test. Thirty-seven higher education students participated in our study. Results suggest that students using deeper levels of processing spent more time in sequences indicative of key information and processed both details and key information in a deeper way. Students in the surface condition spent more time in sequences containing details and factual knowledge while also repeating these sequences more. Students using deeper levels of processing scored higher on the amount and coherence of idea-units they recalled from the video. In conclusion, the use of multiple data sources and multi-layered post-tests is a crucial step in the further development of research on learning from video and more importantly our understanding of how to adequately measure students' cognitive processing in learning from videos.

Effects of Design Decisions of Educational Video Games on Learning and Students' Thoughts
Keywords: Comprehension of Text and Graphics, Game-based Learning, Multimedia Learning, Video-based Learning
Presenting Author: Ercan TOP, Bolu Abant Izzet Baysal University, Turkiye; **Co-Author:**Emre GÜNEL, Abant İzzet Baysal University, Turkiye

This study aimed to determine the students' opinions about the methods and techniques applied in developing an educational game for vocabulary teaching. Therefore, a mixed methodology was chosen to investigate all factors thoroughly. The researchers developed the game using the RPG Maker engine. The game's familiar and exciting environment map was based on a small town where the students live. Also, the characters were based on the students' real-life teachers. In addition, a series of puzzles, quests, and minigames were created to make the game fun and challenging. “Popping name tags” were used to teach words to create incidental vocabulary learning. Ninety-six students studying at a public secondary school comprise the study's sample. The students were given the achievement test developed by the researcher, and 18 were interviewed. The experimental group's post-test success and the experimental group's retention were higher than the control group's. The interviews of the students support the findings and show the success of designing the game according to the students' real life.

A test of a cinematographic principle in learning a first aid procedure from video
Keywords: Comprehension of Text and Graphics, Eye Tracking, Instructional Design, Multimedia Learning
Presenting Author: Jean-Michel Boucheix, University of Dijon, LEAD-CNRS, France; **Co-Author:**Martin Merkt, Deutsches Institut für Erwachsenenbildung, Germany; **Co-Author:**Julie Perrin, University of Dijon, LEAD-CNRS, France; **Co-Author:**Joanna Duval, University of Dijon, LEAD-CNRS, France; **Co-Author:**Alexandre Benoist, Biomedical Engineering and Innovation Direction, CESITECH, William Morey Hospital, Chalon sur Saone, France; **Co-Author:**Stéphane Argon, University of Dijon, LEAD-CNRS, France; **Co-Author:**Stéphanie Javelier, Anesthesia Department, CESITECH, William Morey Hospital, Chalon sur Saone, France

The design of educational videos according to cinematographic principles may affect their potential effectiveness for learning. In previous experiments, we studied the effect of film continuity in learning a medical hand procedure in nurse training. We tested the effect of violating the 180° rule which states that the camera should stay on the same side of an imaginary 180° axis when an ongoing event is filmed. In a pre-post experiment, nurses' students were assigned to two groups that learnt a Cardio-Pulmonary Resuscitation (CPR) procedure from a video with continuous (respecting the 180° rule) versus discontinuous (violating 180° rule) camera viewpoint changes. Results showed that learners with lower prior knowledge were harmed by discontinuity, compared to continuity. Because nurse participants generally had high prior knowledge, the new present study has two goals (i) replicate the experiment and confirm the previous results with more novice learners (ii) explore the underlying cognitive processes using an eye tracking investigation during the learning phase. Fifty-six University students (not in health domain) were assigned to two groups that learnt the same CPR procedure from a video with continuous versus discontinuous camera viewpoint changes, and were eye tracked. Learners were more disoriented in the discontinuous condition than in the continuous condition, indicating that violating the 180° rule tasked the participants with mapping the spatial references in the adjacent shots. However, these additional task demands did not negatively affect learning outcomes.

Session E 20

23 August 2023 12:00 - 13:30
UOM_CR
Single Paper
Higher Education, Learning and Social Interaction, Lifelong Learning

Educational Policy Initiatives in Secondary and Higher Education

Keywords: Competencies, Curriculum Development, Economics of Education, Educational Policy, Higher Education, Primary Education, Qualitative Methods, Secondary Education, Synergies between Learning / Teaching and Research, Teacher Effectiveness, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Jason Chen, College of William and Mary, United States

Entrepreneurship in school education: policy directions and pedagogical considerations
Keywords: Competencies, Primary Education, Secondary Education, Teaching/Instructional Strategies
Presenting Author: Sofia Boutsiouki, University of Macedonia, Greece; **Co-Author:**Nikolaos Mouratoglou, European Schoolnet, Belgium

Entrepreneurship is as an important activity for modern countries due to its multifaceted economic and social impact. For this reason, it is promoted as an attractive career option for young people, while countries are expected to focus on introducing entrepreneurship in their educational systems. In this context, the current presentation discusses the development of the EU policy regarding the inclusion of entrepreneurship education in the European policy agenda and the creation of an entrepreneurship education ecosystem. It also analyses the EU efforts to encourage national education systems to foster entrepreneurial learning with a special focus on initiatives fostering entrepreneurship in school education. Moreover, the presentation discusses the findings of a survey that was conducted by European Schoolnet aiming at collecting school staff's views on innovation and entrepreneurship competences. The survey was open on School Education Gateway from January until March 2022 and attracted 121 respondents from 33 countries, 79% of whom were teachers or school leaders. The results suggest that both competences are integrated in the school curricula through cross-curricular approaches and other school activities, while approximately eight out of ten respondents indicate that both competences should be given more emphasis at school level. Additionally, participants report their views concerning the supportive resources (e.g., teaching materials, networks, professional development) and teaching practices (e.g., simulations, outdoor learning) which seem to be effective in teaching innovation and entrepreneurship competences.

A Delphi Study at secondary schools to identify entrepreneurship education norms
Keywords: Competencies, Curriculum Development, Economics of Education, Secondary Education
Presenting Author: Sultan Goksen-Olgun, Maastricht University School of Business and Economics, Netherlands; **Co-Author:**Wim Groot, Maastricht University, Netherlands; **Co-Author:**Ingrid Wakkee, Amsterdam University of Applied Science, Netherlands; **Co-Author:**Richard Martina, Amsterdam University of Applied Science, Netherlands

According to the European policy agenda, promoting entrepreneurship is an essential societal task that cannot be started early enough. Education plays an important role here, as entrepreneurship can be taught. This has led to tremendous growth in the provision of entrepreneurship in various levels of education, including secondary education, in recent decades. Despite the growth in entrepreneurship offerings, little attention has been paid in the literature to educational programs and widely accepted standards in entrepreneurship targeting high school students. The primary purpose of this study is to examine what entrepreneurship in secondary education, according to teachers, should include in terms of knowledge, attitudes, skills, and reflections. To this end, a Delphi survey was conducted among stakeholders in entrepreneurship education in the Netherlands. The results were used for all characteristics to compile a top three deemed necessary when providing entrepreneurship in secondary education. Based on these results, these competencies were cataloged into frameworks in the entrepreneurship literature.

Roles in teacher teams within higher education: a review
Keywords: Educational Policy, Higher Education, Synergies between Learning / Teaching and Research, Teacher Professional Development
Presenting Author: Belinda Ommering, Utrecht University of Applied Sciences, Netherlands; **Presenting Author:**mieke koeslag-kreunen, Hogeschool Utrecht (University of Applied Sciences Utrecht), Netherlands

High-quality higher education requires versatility of teaching staff. Existing literature refers to long lists of tasks, but these overviews assume teachers to be individual all-rounders. It also ignores the fact that working contexts of teachers are diverse. Such traditional perspectives do not align with today's urge for teachers to be flexible and adaptable and do not support sharing responsibilities in teacher teams. This scoping review identifies teacher roles and their combinations, while also considering the different contexts in which teachers might be working. Analyses on the detected empirical and peer reviewed studies present a range of teacher roles (e.g., instructor, leader, researcher, developer) that appear in various contexts (e.g., universities, practices, online and class room settings). Combinations of roles and contexts were also found (e.g, sharing leadership roles, blending online and class room teaching). Our worldwide and multidisciplinary scoping review provides an innovative perspective compared to existing overviews that focus on individual practice, single roles, fragmented tasks and neglect combinations or contexts. Moreover, it presents modern role descriptions that can promote agility, professional development and collaboration in teams. These contemporary role descriptions reflect the various professional aspects of working in higher education and may even potentially attract, retain, recognize and value new and diverse educational talent.

Double First-Class Initiative : An application of performance-based funding at a Chinese university
Keywords: Educational Policy, Higher Education, Qualitative Methods, Teacher Effectiveness
Presenting Author: Iat Fei Lam, The Chinese University of Hong Kong (CUHK), Hong Kong; **Co-Author:**Manhong Lai, The Chinese University of Hong Kong, Hong Kong

With the ascendency of New Public Management, performance-based funding systems (PBFS) have become widespread in many countries. The intended and unintended consequences of PBFS have been widely discussed in previous studies. This study uses qualitative methods to investigate the implementation of internal PBFS and its impact on a university in China. We conducted in-depth interviews at a sample university which is a Double First-Class university with serval First-Class disciplines. Twelve academics in three different situation disciplines were interviewed. First, the structure of the internal PBFS is almost the same as the directive of the Double First-Class Initiative, and the motivation for implementing the internal PBFS is accountability and efficiency instead of excellence. Second, academics must change their publishing strategy and sacrifice their time on teaching to achieve better performance in the evaluation. Third, most academics feel burnout and loneliness due to the enormous pressure of publishing.

Session E 21

23 August 2023 12:00 - 13:30
UOM_A13
Single Paper
Assessment and Evaluation, Cognitive Science, Higher Education

The Complexity of Academic Writing

Keywords: Cognitive Skills and Processes, Communities of Learners and/or Practice, Comprehension of Text and Graphics, Conceptual Change, Doctoral Education, Higher Education, Knowledge Construction, Pandemic, Quantitative Methods, School Effectiveness, Social Interaction, Teaching/Instructional Strategies, Writing/Literacy
Interest group: SIG 12 - Writing
Chairperson: Rosalind Horowitz, United States

How did School Quality Develop During COVID-19 – Analyses on Educational Inequality
Keywords: Pandemic, Quantitative Methods, School Effectiveness, Teaching/Instructional Strategies
Presenting Author: Christoph Helm, Johannes Kepler University Linz, Austria; **Co-Author:**Stephan Gerhard Huber, PH Zug, Switzerland

Since the sudden occurrence of the pandemic caught most schools unprepared, it is reasonable to assume that the switch to distance learning was accompanied by losses in school quality as well as instructional quality. Empirical research has not yet examined whether and to what extent school quality suffered because of the school closures, and whether socially distressed schools suffered greater declines in quality. In the present study, we analyze these questions based on teacher reports from a trinational study in Germany, Austria, and Switzerland (N=1.241). Our findings show that socially disadvantaged schools did suffer more form the pandemic, i.e., the had higher losses in educational quality.

The Writing-Reading Nexus: Authors and Their Audiences
Keywords: Communities of Learners and/or Practice, Comprehension of Text and Graphics, Social Interaction, Writing/Literacy
Presenting Author: Nancy Nelson, Louisiana State University, United States; **Co-Author:**Kim Skinner, Louisiana State University,, United States; **Co-Author:**Estanislado Barrera, Louisiana State University, United States

Writing-reading relations, which are at the core of written communication, deserve their central role in writing research. This paper reviews research into four major ways in which writing and reading are connected in academic writing. For the "constructing meaning connection," the focus is on cognitive research into reading and writing, which since the 1970s has examined the constructive nature of both processes and has countered portrayal of reading as the inverse of writing, or vice versa. For the "intertextual connection," attention is on studies into transformations that are made when writers compose their own texts from one other source text, as in summarizing, translating, or critiquing, as well as when they perform discourse synthesis from multiple extant texts by organizing, selecting, and connecting content. For the "knowledge resources connection," emphasis is on relations between reading and writing abilities and on the application of various kinds of knowledge. And, for the "social and cultural connection," the review addresses research into audience influences on writing, citations of other authors, collaborative writing, response to writing, and author-oriented reading. The international bodies of work that are summarized, which come from different disciplines and are associated with different traditions and epistemologies, can be viewed as an ongoing collaborative quest to understand these four kinds of relations that are so important in communication through written language.

Measuring discovery through writing
Keywords: Cognitive Skills and Processes, Conceptual Change, Knowledge Construction, Writing/Literacy
Presenting Author: David Galbraith, University of Southampton, United Kingdom; **Co-Author:**Amy Peters, University of Southampton, United Kingdom; **Co-Author:**Sophie Hall, University of Southampton, United Kingdom; **Co-Author:**Veerle Baaijen, CLCG University of Groningen, Netherlands

Despite the general agreement that writing leads to the development of understanding, there is scant research assessing how writing affects writers' subjective state of understanding. In this presentation, we describe our attempt to develop a multi-item scale capable of distinguishing between subjective understanding and organization and we assess its psychometric properties. Exploratory factor analysis of 165 students' ratings of 12 knowledge statements about one of 6

randomly selected topics indicated that a two-factor solution fitted the ratings best. We labelled these factors *Understanding* and *Organisation*. Results of two studies recently carried out using this scale show that: (i) Subjective ratings on these two factors correlate significantly with objective measures of students' knowledge; (ii) Consistent with previous research on illusion of explanatory depth (Keil, 2006), participants show *decreases* in their knowledge ratings after being asked to summarise a text; (iii) Consistent with previous research into more expository writing (Galbraith & Baaijen, 2018), participants show *increases* in subjective knowledge after writing argumentative texts, though this increase is only statistically significant for the organisation measure. We conclude that the new scale is a reliable method for distinguishing between different components of writers' subjective knowledge and argue that this provides a more sensitive measure of subjective knowledge than the single-item rating scales used in previous research.

Research Writing as a Tool for Doctoral Students' and Early Career Researchers' Development
Keywords: Doctoral Education, Higher Education, Knowledge Construction, Writing/Literacy
Presenting Author: Montserrat Castelló, Ramon Llull University, Spain

Writing is crucial to research and also to researchers' careers. In their doctoral programs, students preparing to be researchers are already pressured to write abundantly. However, many report frequent struggles in writing, which vary in their nature as well as causes and consequences. Students typically receive little support for dealing with these struggles with writing, which, if sustained, can undermine their well-being and interest. Difficulties with writing have affected doctoral students' motivation to persist and have been associated with drop-out risk. This paper reviews the growing number of investigations into the challenges that academic writing presents to individuals preparing to be researchers and also to individuals who are new to their careers as researchers in academia. It also reviews attempts to support graduate students' (and their supervisors') writing. We discuss writing processes and difficulties from a sociocultural perspective and provide effective resources and tools to promote novice researchers' writing development.

Session E 22

23 August 2023 12:00 - 13:30
UOM_R09
Single Paper
Teaching and Teacher Education

Teacher Learning and Professional Development

Keywords: Communities of Learners and/or Practice, Digital Literacy and Learning, In-service Teachers, Inquiry Learning, Learning Strategies, Mathematics/Numeracy, Mentoring and Coaching, Qualitative Methods, Quantitative Methods, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Valerie Margrain, Karlstad University, Sweden

Investigating teacher learning? A scoping review on the Interconnected Model of Professional Growth
Keywords: In-service Teachers, Qualitative Methods, Quantitative Methods, Teacher Professional Development
Presenting Author: Elisa Calcagni, Friedrich Schiller Unitersity Jena, Germany; **Co-Author:**Alexander Groeschner, Friedrich Schiller University Jena, Germany; **Co-Author:**Jan van Driel, The University of Melbourne, Australia; **Co-Author:**Hilary Hollingsworth, Australian Council for Educational Research (ACER), Australia

In this scoping review, we address the question of how teacher learning can be investigated and illustrated in a comprehensive way. For this, we refer to the Interconnected Model of Professional Growth (IMPG) by Clarke and Hollingsworth (2002), one of the most cited models in the field. The model emphasises the idiosyncratic way in which teachers' learning processes unfold. The review examines ways that the IMPG has been adopted or adapted in educational research since its initial publication and how it has informed the field to understand and investigate the complex nature of teacher learning. A scoping review employing citation tracking resulted in a final sample of 54 papers that made intensive use of the IMPG to study teacher learning. We found that, as intended, the IMPG is used as an interrogatory, analytic and design tool, in a rich variety of contexts, and in conjunction with different methodological and theoretical frameworks. Furthermore, three patterns of use in empirical research were identified, whereby papers varied with regards to whether and how they actually considered individual learning trajectories. The review identified how some central aspects of the IMPG were reinforced in the ways it was used in the studies examined, whereas other aspects were challenged. Ultimately, the review has provoked consideration of further ideas related to the model's potential use, specifically, to study teacher learning in group learning contexts and by individual teachers to examine and understand their own professional learning and growth.

Supporting & sharing practitioner learning on a global scale through locally-contextualised inquiry
Keywords: Communities of Learners and/or Practice, Digital Literacy and Learning, Inquiry Learning, Teacher Professional Development
Presenting Author: Alison Twiner, Hughes Hall, University of Cambridge, United Kingdom; **Presenting Author:**Sara Hennessy, University of Cambridge, United Kingdom; **Co-Author:**Patrick Carmichael, University of Cambridge, United Kingdom; **Co-Author:**Peter Dudley, University of Cambridge, United Kingdom; **Co-Author:**Ying Ji, University of Cambridge, United Kingdom

Practitioner inquiry is an established approach, and known to be a powerful factor when implemented as a supportive mechanism for professional learning and school improvement. The evidence base underpinning educational policy and practice, however, is largely informed by research conducted by those outside of practice - by academic researchers - with practitioner voices and expertise largely absent. Our work seeks to shift this balance. We will report on the development of a global community of practitioner-researchers and publication platform for educational-practice knowledge. We will outline our own research approach around this development – through design-based research – as well as the inquiry approaches utilised by practitioners submitting their work to the digital publication platform. Through case study exemplars, such as evidencing practitioners' local instantiations of research lesson study, we will illustrate the processes and outcomes of practitioner agency: how these make a difference for their own practice and for their students' learning. We share analysis across interview, focus group and survey data as well as practitioner reports submitted to the publication platform. Drawing across the data sources we evidence the potential benefits and widening ripples of such systematic inquiry and global, openly-accessible sharing - for practitioners, researchers, policymakers and learners - toward a goal of rigorous, practitioner-authored evidence influencing practice and policy.

The impact of Research Lesson Study on teacher learning patterns
Keywords: In-service Teachers, Inquiry Learning, Learning Strategies, Teacher Professional Development
Presenting Author: Maria Vrikki, University of Nicosia, Cyprus; **Co-Author:**Leonidas Kyriakides, University of Cyprus, Cyprus; **Co-Author:**Jan Vermunt, Eindhoven University of Technology, Netherlands; **Co-Author:**Chrissavgi Triantafillou, National and Kapodistrian University of Athens, Greece; **Co-Author:**Panayiotis Antoniou, University of Cyprus, Cyprus; **Co-Author:**Efi Paparistodemou, Cyprus Pedagogical Institute, Cyprus; **Co-Author:**Maria Anastasou, University of Cyprus, Cyprus

Although Lesson Study (LS) integrates many of the characteristics of effective professional development, empirical evidence of its association to teacher learning is still scarce. We aim to examine how teachers' participation in LS affects their own learning patterns, which refer to a set of learning activities, beliefs and motivations about teaching and learning. We also aim to examine how different types of support offered to LS groups in the form of an advisor in the subject matter and a facilitator of the LS process, can affect teachers' learning patterns. To examine these aims, we conducted a two-phase study in Cyprus and Greece that was part of a larger EU project. In Phase I, we aimed to validate the *Inventory of Teacher Learning*, which was translated into Greek and measures three different types of teacher learning patterns: meaning-oriented learning, application-oriented learning and problematic learning. Having administered the questionnaire to 253 secondary school teachers, we used confirmatory factor analysis and found that a three-factor model had a good fit to our data, despite a high correlation between meaning-oriented and application-oriented learning. Phase II concerns an intervention study with two experimental groups that conduct LS, but with different types of support, and a control group that was not introduced to LS. Regression analyses from Phase II will determine whether teachers' participation in LS has an effect on their learning and whether the type of support plays a role. The outcomes of the study have theoretical, methodological and educational significance.

Supporting Secondary Mathematics Coaches' Learning Through One-on-One Meta-coaching
Keywords: In-service Teachers, Mathematics/Numeracy, Mentoring and Coaching, Teacher Professional Development
Presenting Author: Hilda Borko, Stanford University, United States; **Co-Author:**Marsha Ing, University of California, United States; **Co-Author:**Michael Jarry-Shore, Boise State University, United States; **Co-Author:**Thomas Smith, Vanderbilt University, United States

“Responsive coaching” (Dozier, 2006) uses individual teachers’ needs to guide the coaching process. Similarly, responsive meta-coaching tailors support to individual coaches’ needs. This study explored a meta-coaching program in which a more experienced and accomplished coach supported coaches to become more effective in their work with teachers to improve their mathematical instructional practices and create more equitable learning experiences for all students. We use a case study methodology to examine the meta-coaching relationship between one meta-coach and one coach as that coach worked with four middle school mathematics teachers in a set of individual coaching cycles over a two-year period. Data include audio-recordings of interviews with the meta-coach and coach at the beginning and end of each year, field notes and artifacts from the lessons, student responses to surveys about their experience in the lesson, and audio-recordings of planning and reflection meetings. Preliminary findings suggest three major themes: the meta-coach tailored their work with the coach; the coach perceived their work with the meta-coach to be useful with all four teachers; and the meta-coach and coach found it useful to have multiple artifacts of practice, particularly for enabling conversations about equity. This research extends the literature on coaching by demonstrating that, like responsive coaching, responsive meta-coaching can be an effective way to support coaches in their work with teachers. It also suggests that the theoretical concepts used to describe the preparation of professional development facilitators (Prediger et al., 2019) are applicable to the preparation of coaches.

Session E 23

23 August 2023 12:00 - 13:30
UOM_R01
Poster Presentation
Learning and Social Interaction, Lifelong Learning, Motivational, Social and Affective Processes, Teaching and Teacher Education

Fostering Robust, Ecologically-Valid and Sustainable Approaches to Self-Regulated Learning in Schools

Keywords: In-service Teachers, Lifelong Learning, Metacognition, Primary Education, Quantitative Methods, School Leadership, Self-regulated Learning and Behaviour, Teacher Professional Development, Teaching Approaches, Teaching/Instructional Strategies
Interest group: SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Christian Brandmo, University of Oslo, Norway

Effects of in-service teacher training on professional competences in self-regulated learning
Keywords: Lifelong Learning, Quantitative Methods, Self-regulated Learning and Behaviour, Teacher Professional Development
Presenting Author: Carmen Nadja Hirt, University of Zurich, Switzerland; **Co-Author:**Tabea Daria Eberli, University of Applied Sciences and Arts Northwestern Switzerland PH (FHNW), Switzerland; **Co-Author:**Johannes Jud, University of Zurich, Switzerland; **Co-Author:**Amina Rosenthal, University of Applied Sciences Northwestern Switzerland, Switzerland; **Co-Author:**Yves Karlen, University of Zurich, Switzerland

Developing teachers' professional competences in self-regulated learning (SRL) is essential for increasing SRL implementation in class. Previous evaluations of such teacher training focused mainly on the effects on teachers' promotion practices. Building on the integrative model of teachers' professional competences in SRL (Karlen et al., 2020), training should go beyond and thus focus on developing teachers' competences as self-regulated learners and agents of SRL. The present study analyzes the effects of multi-day teacher training in SRL on teachers' competences (1) as self-regulated learners and (2) as agents of SRL. The intervention study with a pre-post and control group design surveyed $N = 54$ teachers ($n_{EG} = 31$; $n_{CG} = 23$) with an average professional experience of 16.48 years ($SD = 10.13$). Teachers were 61.1% female and on average $M = 34.56$ years ($SD = 8.95$) old. Self-report and knowledge tests were used to assess teachers' own SRL competences, their competences as agents of SRL, and their SRL instructional practices. Mixed ANOVAs were used to examine possible interaction effects (time*group). Results indicate effects on teachers’ beliefs and some of their motivational competences as agents of SRL and self-regulated learners but not on their knowledge. A discussion on how teacher training in SRL must be designed to show the desired effects is needed. Initial further analyses show a benefit for teachers with lower level of knowledge at t1 regarding their PCK-SRL development. The results suggest that there is probably no "one size fits all" in the field of teacher training in SRL.

Relating Teacher Views of Self-Regulated Learning with Classroom Practices and Students’ SRL
Keywords: Metacognition, Self-regulated Learning and Behaviour, Teacher Professional Development, Teaching Approaches
Presenting Author: Nancy Perry, University of British Columbia, Canada; **Co-Author:**Marissa Hall, The University of British Columbia, Canada; **Co-Author:**Xinke Wan, University of British Columbia, Canada; **Co-Author:**Martin Dammert, The University of British Columbia, Canada; **Co-Author:**Hazel Ryan Sheehan, The University of British Columbia, Canada; **Co-Author:**Lynda Hutchinson, King's University College at the University of Western Ontario, Canada

Research indicates capacities for self-regulating learning (i.e., being metacognitive, motivated for learning, and strategic) are assets for *all* students (i.e., linked to achievement and other indicators of success in school). Recognizing this relationship, researchers are turning their attention to supporting teachers to support SRL in their classrooms. Attempts to achieve uniformity in implementing supports for SRL can prove frustrating because teachers come to projects with varying beliefs, amounts of interest, and expertise about SRL. Also, their response to SRL innovations likely depends how innovations “fit” with their teaching and learning context. Our participatory approach to research positions teachers as co-learners, *with* researchers, studying how to support SRL in classrooms. In this poster we present data from a year-long collaboration with 12 5^{th} grade teachers. We articulate differences in teachers’ beliefs and understandings about SRL and ask: (a) how are these differences reflected in the SRL promoting practices they employ in their classrooms; and (b) how do aspects of students’ self-reported SRL (affect, motivation, strategy use) relate to the contexts they are in? Our analyses point to four groups of teachers, differentiated on the basis of views about SRL, different patterns of SRL practices across these groups, and differences among students’ self-reported affect, motivation for learning and strategies used across these contexts. In general, findings offer insights about how to collaboratively build robust (ecologically valid and sustainable) SRL innovations with teachers in schools that are customized for their students.

Professionalizing teachers on SRL: School counselors’ perspectives on barriers and opportunities
Keywords: In-service Teachers, School Leadership, Self-regulated Learning and Behaviour, Teacher Professional Development
Presenting Author: Lies Backers, Ghent University, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium

The implementation of self-regulated learning (SRL) in primary and secondary schools is complex and requires a sustainable long-term development of the complete school. To support school leaders and their team of teachers to implement SRL, a two-year school-wide professionalization program was designed in collaboration with an in-service teacher professionalization organization. School counselors working as in-service teacher trainers in this organization support the school leaders with the school-wide implementation. This study focuses on the perspective of the school counselors and more specifically on the opportunities, the challenges, and barriers they experience during professionalizing school teams on SRL implementation. Two-monthly focus group with the counselors were executed to gain more insight in their perspectives. Five focus groups with all school counselors already took place; five more are planned during the currently ongoing in-service teacher professionalization. Thematic analysis is used to analyze the qualitative data gathered during the focus groups. Preliminary results show that school counselors themselves hold misconceptions about SRL and lack confidence to work with SRL theory. Besides a lot of challenges, school counselors mentioned also opportunities. The presentation will present more detailed results as well as implications for practice and further research.

A multi-site video study exploring self-regulation strategies to foster 21st century skills
Keywords: Metacognition, Primary Education, Self-regulated Learning and Behaviour, Teaching/Instructional Strategies
Presenting Author: Therese Hopfenbeck, University of Melbourne, Australia; **Co-Author:**Samantha-Kaye Johnston, The University of Oxford, United Kingdom;

Co-Author: Joshua McGrane, The University of Melbourne, United Kingdom; **Co-Author:**Juliet Scott-Barrett, University of Oxford, United Kingdom; **Co-Author:**Tracey Denton-Calabrese, University of Oxford, United Kingdom

Over the last four decades, teachers and researchers have increasingly focused upon how best to support students to become self-regulated learners, as self-regulation is viewed as a key skill in enhancing 21st century attributes such as creativity. Self-regulated learners are proactive, they set goals, they are good at managing their time, and use strategies which are adapted to the tasks they are supposed to solve. In a complex world of uncertainty, teaching self-regulation can be seen as equipping students with the ability to grow and learn *after* they leave school. The current study investigated how 22 primary school teachers facilitated students' development of self-regulation, aimed at facilitating student creativity, in nine countries, in 19 primary school classrooms. Video data (n = 46 videos) from each classroom were remotely collected during the pandemic in 2021. Teachers and students were interviewed about their experiences of self-regulation strategies within the classroom and how these related to the development of creativity skills. Through reflexive thematic analysis, three researchers analysed the videos of the classrooms and interviews, and categorised practices related to the use of self-regulation strategies to foster creativity. The findings demonstrated that teachers employed a range of self-regulatory strategies, including goal setting, planning and time management across the different classrooms. Importantly, teachers considered student's individual differences while implementing these strategies. Based on these findings, we discuss the importance of this study for supporting more responsive classroom practices as well facilitating more diverse and achievable classroom-based research across international borders.

Session E 24

23 August 2023 12:00 - 13:30
UOM_R02
Poster Presentation
Assessment and Evaluation, Teaching and Teacher Education

Using Feedback in Teaching and Assessment

Keywords: Assessment Methods, Attitudes and Beliefs, Classroom Assessment, Classroom Management, Cognitive Skills and Processes, Educational Policy, Engagement, Feedback, Higher Education, Peer Interaction, Pre-service Teachers, Quantitative Methods, Secondary Education, Social Aspects of Learning and Teaching, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 01 - Assessment and Evaluation, SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development
Chairperson: Annika Käck, Stockholm University, Sweden

A New Measure for Assessing Teacher Education Students' Peer Feedback Beliefs
Keywords: Attitudes and Beliefs, Feedback, Peer Interaction, Pre-service Teachers
Presenting Author: Marit Puusepp, University of Tartu, Estonia; **Co-Author:**Pihel Hunt, University of Tartu, Estonia; **Co-Author:**Gerli Silm, University of Tartu, Estonia

To date, there are few instruments available for the quantitative study of students' peer feedback beliefs and existing questionnaires cover some, but not all, of the relevant aspects found in literature. The aim of the study was to create a unified peer feedback beliefs questionnaire and validate it on a sample of pre-service teachers. Cognitive interviewing (n = 7) was used for the preliminary validation of the instrument. Confirmatory factor analysis (n = 196) was performed for further validation, resulting in a peer feedback beliefs model with six constructs: importance of peer feedback skills; quality of given peer feedback; quality of received peer feedback; usefulness of peer feedback implementation; peer feedback competence; and coping with emotions. Discriminant and convergent validity of the instrument were evidenced by low factor correlations and high AVE values respectively. Internal reliability according to Mcdonald's omega was also deemed acceptable. The surveyed students rated different peer feedback aspects highly, but distinctly: e.g., students believed they provide higher quality feedback than they receive. The questionnaire could be used to assess teacher education students' peer feedback beliefs and to improve instruction in teacher education.

Noticing, awareness, modes of cognition: An integrated model for teachers' professional d evelopment
Keywords: Classroom Management, Cognitive Skills and Processes, Feedback, Teacher Professional Development
Presenting Author: Els Boshuizen, Open University of the Netherlands, Netherlands; **Co-Author:**Charlotte Eliza Wolff, University of Iceland - School of Education, Iceland; **Co-Author:**Karel Kreijns, Open University of the Netherlands, Netherlands; **Co-Author:**Dorothy Duchatelet, Open Universiteit, Department of Online Learning and Instruction, Netherlands; **Co-Author:**Halszka Maria Jarodzka, Open Universiteit, Department of Online Learning and Instruction, Netherlands

A dominant conceptual framework for the description and interpretation of teacher behaviour is the theory of professional vision. The theory includes the concept of noticing – the act of perceiving and identifying classroom situations and student behaviours that reveal potential problems that directly or indirectly might hamper student learning. However, this theoretical framework leaves many open questions, such as: What is the relationship with expertise development and which cognitive processes play a role? And how can teachers learn to handle the multiplicity of fast and slow pace of classroom events taking place simultaneously? In this poster we extend the framework of teacher professional vision by combining Endsley's theory of situation awareness with Eraut's theory of modes of cognition, which discriminates between fast and slow cognition, and brief and long events. Eraut described how the experienced professional navigates the interaction between different kinds of events in relation to speed of perception, and how cognition can constrain in- and on-action reflection, and thus learning through practical experience. Understanding teachers' modes of cognition amidst classroom complexity helps clarify the influence of experience in relation to the development of the fluid, flexible, intuitive scripts and routines that underly teachers' professional vision. Our poster presents a model integrating these perspectives and discusses implications for teacher learning, particularly the potential for enhancing teachers' noticing and situational awareness in the classroom, i.e., the interpretative expertise of professional vision.

A scoping review of research on reduced grading
Keywords: Assessment Methods, Classroom Assessment, Educational Policy, Feedback
Presenting Author: Dan-Anders Normann, Norwegian University of Science and Technology (NTNU), Norway; **Co-Author:**Lise Vikan Sandvik, Norwegian University of Science and Technology (NTNU), Norway; **Co-Author:**Henning Fjørtoft, Norwegian University of Science and Technology (NTNU), Norway

There is considerable interest in changing grading practices to ameliorate their perceived negative impacts on student learning and motivation. Therefore, reducing the role of grades in assessment is becoming popular in various contexts. We conducted a scoping review of 21 peer-reviewed studies that explored the reduced use of grades. Using qualitative content analysis and a theory of action framework to investigate the rationales for going gradeless, we analyzed data to identify changes in assessment practices and to explore how such changes were perceived by teachers and/or students. Six key factors were identified: contextual conditions (e.g., policy changes leading to reduced grading), rationales (e.g., improving psychological or socio-relational dimensions), changes in assessment practices (e.g., moving from grades to pass/fail), conditions for successful implementation (e.g., challenging assessment beliefs), impact on student learning (e.g., improving well-being or impacting student attitudes), and stakeholder concerns (e.g., negatively impacting study habits). Furthermore, although teachers perceived the benefits of going gradeless, students' views were divided. We suggest that building a theory of action approach could help support practitioners in understanding contextual needs, exploring existing assumptions about grading, developing an appropriate action strategy, and evaluating the outcomes of going gradeless.

Students' feedback engagement, feedback perceptions and individual characteristics
Keywords: Engagement, Feedback, Higher Education, Quantitative Methods
Presenting Author: Mona Bassleer, Ghent University, Belgium; **Co-Author:**Nicolas Dirix, Ghent University, Belgium; **Co-Author:**Stijn Schelfhout, Ghent University, Belgium; **Co-Author:**Wouter Duyck, Ghent University, Belgium

Feedback engagement of the feedback receiver is a necessary prerequisite for feedback to be effective in the learning process. However, empirical research that focuses on the use of feedback by students is understudied. In addition, little is known about the potential influencing roles of student feedback perceptions and student characteristics in the relation between feedback and students' feedback engagement. The present study aims to test the relations between received feedback on study orientation, and intentional and behavioral feedback engagement, while also taking student feedback perceptions and student characteristics (i.e., self-control and test anxiety) into account. We use a within subjects-design with self-reported data from first-year university students across the academic years 2021-2022 and 2022-2023. At this moment, we have a sample size of $N = 223$ for the academic year 2021-2022. For the academic year 2022-2023, the data collection is still ongoing. Preliminary results show that received feedback on study orientation has an indirect effect on behavioral feedback engagement and is mediated by intentional feedback engagement. Also, student feedback perceptions, self-control, and test anxiety indirectly influence behavioral feedback engagement, again mediated by intentional feedback engagement. Our findings suggest that interventions should pay attention to students' intentions to engage with feedback. In doing so, especially focusing on the improvement of students' perceptions of feedback (i.e., perceived fairness, usefulness, and acceptance) can add value in supporting students' feedback engagement.

Revealing teachers' conceptualizations of student identity and development: A connection to practice
Keywords: Feedback, Secondary Education, Social Aspects of Learning and Teaching, Teaching/Instructional Strategies
Presenting Author: Emily Gonzalez, University of Southern California, Rossier School of Education, United States; **Co-Author:**Christina Kundrak, University of Southern California, United States; **Co-Author:**Mary Helen Immordino-Yang, University of Southern California, United States

The present study empirically investigates how U.S. urban secondary teachers, identified by their administration as highly skilled, talk about their students' development of academically relevant social-emotional capacities. Independent observers rated 40 high-performing U.S. urban public secondary teachers' classroom practices during a 50-minute observation using a validated framework measuring support for deep learning. Participating teachers were then invited for a separate lab-based interview in which they were prompted to provide feedback to 6 pseudo-randomly sampled students from their classroom. We found that teachers who were rated more highly in their classroom practice more frequently discussed their students' identity development ($r(38)=0.34$, $p=0.03$). Furthermore, we found that teachers who more frequently discussed the themes of students' identity ($r(38)=0.36$, $p=0.02$) and self-esteem ($r(38)=0.39$, $p=0.01$) showed overall greater complexity in the open-ended feedback they provided to their students. In addition to the theme of student identity, teachers who were ranked in the highest quartile of classroom practices tended to consider students' broader dispositional and developmental growth, while teachers ranked in the bottom quartile of classroom practices tended to consider instrumental and behavioral factors. Results indicate that high-quality teaching likely requires a broader and developmentally oriented understanding of students' social-emotional and academic capacities, underscoring the importance of developing teachers' deep knowledge of student development rather than focus solely on instrumental practices.

Session E 25

23 August 2023 12:00 - 13:30
UOM_R03
Poster Presentation
Culture, Morality, Religion and Education, Developmental Aspects of Instruction, Learning and Instructional Technology, Learning and Social Interaction, Teaching and Teacher Education

Collaborative Learning

Keywords: Citizenship Education, Competencies, Computer-assisted Learning, Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Curriculum Development, Health-care Education, Mixed-method Research, Pandemic, Primary Education, Qualitative Methods, Religiosity and Spirituality, Social Interaction
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education, SIG 19 - Religions and Worldviews in Education, SIG 25 - Educational Theory
Chairperson: Marjaana Veermans, University of Turku, Finland

How do groups learn in a virtual space? Didactic and social implications of breakout rooms
Keywords: Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Mixed-method Research, Pandemic
Presenting Author: Sabrina Gerth, University College of Teacher Education Tyrol, Austria; **Co-Author:**Mario Vötsch, University College of Teacher Education Tyrol, Austria; **Co-Author:**Anja Steiner, University College of Teacher Education Tyrol, Austria; **Co-Author:**Gerlinde Schwabl, University College of Teacher Education Tyrol, Austria

We explore the didactic and social dimensions of collaborative learning in virtual group rooms. Breakout rooms are defined as social arrangements including interaction processes that may promote learning effects under certain conditions. In the first survey, we asked nineteen students of a master's program in vocational education to evaluate the learning environment in breakout rooms. Afterwards, the same students were interviewed in groups to follow-up on their responses in the survey. They were asked about general conditions and characteristics of breakout rooms as virtual learning environments. In a second survey, we are planning to ask master students in primary school education about their learning experiences in breakout rooms. We will then compare the results of both groups to generalize their implications about teaching and learning contexts. So far, our results highlight the influence of factors such as time constraints, work assignments, group size and group composition on collaborative learning in breakout rooms. Consequently, virtual spaces require a reflective use of instructional methods and clearly structured work assignments. The role of the lecturer in a virtual space seems to focus on preparing the learning-settings (e.g., preparation and moderation of the learning process) and ensuring an output of the learning phase. We conclude by summarizing implications and suggestions that can be transferred into other virtual or analog learning environments.

A Digitally Enhanced Primary School Mathematic Classroom – A Case-Study
Keywords: Computer-assisted Learning, Computer-supported Collaborative Learning, Primary Education, Qualitative Methods
Presenting Author: Frauke Kesting, SCRIPT, Luxembourg; **Co-Author:**Catalina Lomos, LISER - Luxembourg Institute for Socio Economic Research, Luxembourg; **Co-Author:**Sibel Telli, Canakkale Onsekiz Mart University (COMU), Turkiye; **Co-Author:**Undine Seineke, Luxembourg Institute of Socio-Economic Research (LISER), Luxembourg

This qualitative case study, using video-based research complemented with teacher interviews and focus group, examines teacher and students' classroom experiences during one digitally enhanced mathematic lesson in primary education in Luxembourg. With this study, we aimed to observe the teacher's role, classroom interactions and the lesson structure and explore three research questions: 1) What is the teacher's role in a lesson where a digital learning platform for mathematics has been integrated? 2) What are the teaching strategies used and the lesson structure? 3) What are the classroom interactions (teacher-student, student-student) in a digitally enhanced lesson? The nineteen students in the last grade of primary education were in the video-recorded lesson. Their teacher is an experienced teacher, working in close collaboration with other four teachers teaching at the same grade level in the school. The setting was that students work individually with the digital learning platform in one math lesson, managed and organized as a usual math lesson by their teacher. For the focus group and interviews, all five teachers in that school who teach the same class level, including the teacher of the filmed classroom, participated in a focus group and individual interviews. The results showed that, the digitally enhanced classroom allowed for the transition from the teacher-centred lesson to a more self-regulated student learning, and supported peer-learning interactions, while shifting teacher's role towards a facilitator of learning. We will discuss these findings also in light of teachers' reports on the challenges digital learning integration raises in their professional practice.

The influence of collaborative hybrid learning on students' competence development and interaction
Keywords: Competencies, Cooperative/Collaborative Learning, Health-care Education, Social Interaction
Presenting Author: Sari Pramila-Savukoski, University of Oulu, Finland; **Co-Author:**Raila Kärnä, University of Oulu, Finland, Finland; **Co-Author:**Heli-Maria Kuivila, University of Oulu, Finland, Finland; **Co-Author:**Ashlee Oikarainen, University of Oulu, Finland, Finland; **Co-Author:**Tiina Susanna Törmänen,

University of Oulu, Finland; **Co-Author:**Jonna Juntunen, University of Oulu, Finland, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland; **Co-Author:**Kristina Mikkonen, University of Oulu, Finland, Finland

Education in health sciences prepares future experts for society with competence in evidence-based health care, leadership and collaboration. Recent changes in education and its transformation to more digital have brought up challenges. Hybrid learning, that enables to participate in teaching both face-to-face and remotely, has challenged educators to develop teaching competence and students to develop their health science competence. There has been little research on collaborative learning in hybrid learning environments. The aim of this study was to evaluate the influence of collaborative hybrid learning on health sciences students' competence development and collaborative interaction. Hybrid collaborative learning was observed from four small groups of health science undergraduate students (n=17) in a university using video recordings during the three- lesson. Observational data on health science competence and verbal interactions during collaboration were analysed using coding-and-counting methods, and the results were described using percentages, frequencies, and descriptive examples. The results showed that health science students' competence development was strongly reflected in their collaborative interactions, where they demonstrated analytical thinking, problem solving, collaboration, communication and technological skills. Students effectively used collaborative work time to complete tasks, with cognitive interaction observed in 85% of the data and socio-emotional interaction in 53% of the data. The results show how competence and interactions are constructed in hybrid collaborative learning and show, that hybrid collaborative learning support students' competence development if digital environments are adequately resourced and well-organized. Further multifaceted research need to be conducted to examine effect of hybrid learning in health sciences competence development.

International partnership in cooperation for democratic values in primary education
Keywords: Citizenship Education, Cooperative/Collaborative Learning, Curriculum Development, Primary Education
Presenting Author: Natalia Demeshkant, Pedagogical University of Krakow, Poland; **Co-Author:**Stefanie Schnebel, University of Education Weingarten, Germany; **Co-Author:**Katarzyna Potyrala, Pedagogical University of Cracow, Poland; **Co-Author:**Mareike Brehmer, University of Agder, Norway; **Co-Author:**Hilke Rapp, PH Weingarten, Germany; **Co-Author:**Aslaug Kristiansen, University of Agder, Norway; **Co-Author:**Inger Marie Dalehefte, University of Agder, Norway; **Co-Author:**kristin endresen-maharaj, University of Agder, Norway; **Co-Author:**Georg Kristoffer Fjalsett, University of Agder, Norway; **Co-Author:**Marion Visotschnig, Pädagogische Hochschule Weingarten, Germany

The study presents preliminary results after the first edition of the Erasmus+ project Values in democracy education - enhancing competencies and beliefs of teacher students (VALIDE). Three universities (University of Weingarten, Germany, University of Agder, Norway and Pedagogical University of Krakow, Poland) are cooperating in the project. As a result of the project a study trans-national student collaboration program "Democracy Values Education in Primary schools" was designed. Students enrolled in the course were encouraged to get involved in exchange and preparation for their stay abroad with students from partner universities. The study research question: Which are the motives and aims teacher students express while joining the tri-national exchange program focussing on democratic values and value education? The study materials were Polish and German students (n=14) interviews after completing the first edition of the project exchange program. Analysis of the data suggested several narratives from the findings. The first focuses on the student's motives and expectations regarding international cooperation. The analysis shows that the students are expected to enter into international professional relationships and experience the educational teacher training process abroad in the project-partners countries. The second aspect of the analysis considers students' experiences of working together with students or other people from abroad. Here the analysis shows that students evaluated their international cooperation experience as an opportunity to learn about different points of view on social and educational issues. In a conclusion, we can state that effective teacher education for diversity and democracy needs partners from outside the own cultural community.

The socio-materiality of learning through Minecraft education during the pandemic: a case study
Keywords: Computer-supported Collaborative Learning, Pandemic, Qualitative Methods, Social Interaction
Presenting Author: Giuseppe Ritella, University of Campania Luigi Vanvitelli, Italy; **Co-Author:**Ivana Lorusso, University of Foggia, Italy; **Co-Author:**Maria Beatrice Ligorio, University of Bari, Italy

The present paper presents the results of a case study involving 50 students aged between nine and ten years, who participated in a multi-year educational activity based on the pedagogical use of Minecraft. Theoretically, the paper is based on previous research conceptualizing and empirically operationalizing the complexity of socio-material relations in the context of making-based activities, which includes both the creation of material objects in makerspaces and the construction of virtual buildings and objects. The collected dataset includes 1) two questionnaires, 2) video recordings of students' presentations of their virtual worlds, 2) group interviews, and 3) screen recordings of the educationally relevant gameplay of a sample of students. The data analysis involved the qualitative content analysis of the interviews and of the open-ended questions of questionnaires; as well as the video analysis of the screen recordings of the students' activity in the virtual world and of the presentation of the virtual worlds. The analysis of the quantitative data deriving from the questionnaires was carried out by means of descriptive statistical analysis. The findings shows that 1) complex socio-material configurations of participation were orchestrated in real time with relative independence by the students; 2) different clusters of interconnections emerge between the students' perception of educational activities in Minecraft and their experiences related to the pandemic, as well as between learning through play and extra-curricular life. Finally, during the interviews, several students discuss how they have reconsidered some beliefs and stereotypes concerning online gaming and STEM disciplines.

Back to the Future: Cooperation as a Forgotten Art During the Pandemic
Keywords: Cooperative/Collaborative Learning, Pandemic, Qualitative Methods, Religiosity and Spirituality
Presenting Author: Petra Juen, Institut für Praktische Theologie, Fachbereich Religionspädagogik, - didaktik und Katechetik, Austria

We are in a time of many uncertainties: the ecological crisis, the war in Europe, the Covid 19 pandemic since 2020. These and many other factors contribute to social insecurity. Educational institutions such as schools, but also universities are reflecting their teaching. In my contribution, I would like to address the following questions: · To what extent can cooperation be a path of hope in uncertain times? · How does teaching change in uncertain times? · Who and what supports inclusion and exclusion of “hard to reach” students during uncertain times?I will address these questions from a religious education perspective in the Austrian context. My qualitative-empirical dissertation study, which deals with the challenges, opportunities, and limits of interreligious and interdenominational cooperation before 2020 serve as the data basis. Furthermore, qualitative interviews with teachers are currently conducted to enlarge the perspective.In Austria, the situation of religious education is unique in Europe. A total of 16 recognized religions and religious communities can provide confessional religious education at schools. Since school year 2021/22 ‘ethics’ has been introduced nationwide as a compulsory subject at secondary level in addition to the subjects of religious education. The examination of a cooperation before, during and ‘after’ the pandemic allows a development of possible implications for the training of religious education teachers. In addition, the contribution raises questions about the quality and quantity of teaching in uncertain times, touches the conversion to online-teaching-formats and discusses the remains of it.

Session E 26

23 August 2023 12:00 - 13:30
UOM_R04
Poster Presentation
Assessment and Evaluation, Cognitive Science, Learning and Special Education

Mathematics and Numeracy in Primary Education

Keywords: Assessment Methods, Classroom Assessment, Cognitive Skills and Processes, Computational Thinking, Early Childhood Education, Learning and Developmental Difficulties, Mathematics/Numeracy, Pandemic, Primary Education, Problem Solving, Reading, Reasoning, Simulation-based Learning
Interest group: SIG 01 - Assessment and Evaluation, SIG 14 - Learning and Professional Development
Chairperson: Krzysztof Cipora, Loughborough University, United Kingdom

Pilot Study for the Validation of the Number Sense Brief for the Brazilian Context

Keywords: Assessment Methods, Early Childhood Education, Learning and Developmental Difficulties, Mathematics/Numeracy
Presenting Author: Luciana Vellinho Corso, Universidade Federal do Rio Grande do Sul (UFRGS), Brazil; **Co-Author:**Fabiana de Miranda Rocha Luna, Universidade Federal do Rio Grande do Sul, Brazil; **Co-Author:**Amanda Oliveira Meggiato, Universidade Federal do Rio Grande do Sul, Brazil; **Co-Author:**RAQUEL WEBER, Universidade Federal do Rio Grande do Sul, Brazil

This study aimed to present a pilot study, conducted with an adapted version of an American instrument, the Number Sense Brief (NSB), that evaluates the number sense skills in Brazilian children in their last year of Early Childhood Education and first year of Primary Education. The sample consisted of 84 students from public schools in the State of Rio Grande do Sul, who were evaluated with the NSB, TEMA-3 and the Columbia Mental Maturity Scale – 3. Participants also provided data on their socioeconomic status via a questionnaire. Different analyses were performed to evidence psychometric characteristics of the instrument, mainly: confirmatory factor analysis, Cronbach's alpha (α), and Spearman's correlation. The results confirmed that the adapted version of the instrument has three factors, as the original version, which indicates validity, while also having expressed satisfactory reliability indexes and data on the performance of the participants. The new version of the instrument is considered adequate and functional for the new context, with the potential to support the evaluation of number sense.

The Development of Early Numeracy as a Predictor of Math Skills in Primary School
Keywords: Classroom Assessment, Mathematics/Numeracy, Pandemic, Primary Education
Presenting Author: Veronique Dierkx, University Utrecht, Netherlands; **Co-Author:**Bernadette van de Rijt, University Utrecht, Netherlands; **Co-Author:**Sietske van Viersen, University Utrecht, Netherlands

The mathematical abilities of primary school children in the Netherlands have been declining in recent years and results have decreased even more during the pandemic. Although we know that early numeracy (EN) is one of the strongest predictors of children's mathematical abilities, little is known about EN development beyond kindergarten and its predictive value for math skills in the later grades of primary school. Therefore, we studied 1251 children's EN skills across six timepoints between Kindergarten and the end of Grade 1, as well as their general math abilities in the middle grades of primary school. We also considered parental education level and migration background as well as COVID-related school closure as potential predictors impacting on EN development. Using latent growth modeling we found that EN developed linearly throughout between Kindergarten and the end of first grade and that lower parental education levels, parental migration background as more COVID-related school closures negatively affected initial levels and growth rates in EN. Moreover, the EN development significantly predicted math scores in the mid grades of primary education. The importance of assessing EN at an early stage is indicated by our findings, as it allows for early intervention which can alter children's developmental trajectories and positively affect their later math abilities.

The relation between primary school students' adaptive number knowledge and proportional reasoning
Keywords: Mathematics/Numeracy, Primary Education, Reasoning, Simulation-based Learning
Presenting Author: Salla Pehkonen, University of Jyväskylä, Finland; **Co-Author:**Antti Lehtinen, University of Jyvaskyla, Finland; **Co-Author:**Pasi Nieminen, University of Jyväskylä, Finland; **Co-Author:**Markus Hähkiöniemi, University of Jyväskylä, Finland

Balance scale tasks have been widely used to study students' proportional reasoning. However, there is a lack of knowledge of what mathematical skills contribute to the recognition of proportionality in these tasks. Adaptive number knowledge can be reasonably assumed to one be one such skill. Therefore, we studied primary school (2^{nd}, 4^{th}, and 6^{th} grade) students' adaptive number knowledge and if it helps to solve a scientific problem where recognition of mathematical relations is relevant. We used a test with open tasks where students were instructed to produce as many solutions as possible to study students' adaptive number knowledge. In addition, students participated in an intervention where they tried to form a balance rule and solve balance scale tasks in a digital learning environment. There was a relation between students' adaptive number knowledge and their use of proportionality. The students with higher adaptive number knowledge were more likely able to make proportional observations and adaptively use them in different situations. Whereas the students with lower adaptive number knowledge made mostly non-proportional observations when solving balance scale tasks.

Coding in elementary school mathematics lessons? That works!
Keywords: Computational Thinking, Mathematics/Numeracy, Primary Education, Problem Solving
Presenting Author: Jens Dennhard, University of Education Heidelberg, Germany; **Co-Author:**Saskia Schreiter, University of Education Heidelberg, Germany

The teaching of competencies in the context of digitization is already a central goal in primary education. These include informatics competencies, which can, due to the numerous interfaces between mathematics and computer science, be taught in an integrated way in mathematics classes. The research project presented here involves the planning, conception, and empirical evaluation of interdisciplinary learning environments for coding in primary mathematics education (grades 3/4). For this purpose, mathematical topics with algorithmic structures, such as number sequences, are identified from the primary education curriculum and integrated into an age-appropriate digital coding environment. The block-based visual programming language NEPO is used, which is freely available through the online editor Open Roberta Lab (https://lab.open-roberta.org). The learning environments are developed in a design research approach in iterative circles. Based on existing mathematical and computer science didactic theory and research, prototype learning environments are developed, repeatedly empirically tested, and continuously refined by analyzing screen and audio recordings of children's programming processes. The goal is to develop learning environments for coding at the primary level that are practicable and easy to use in mathematics classes.

6-year-olds' different ways of reasoning about a larger collection of items
Keywords: Early Childhood Education, Mathematics/Numeracy, Primary Education, Reasoning
Presenting Author: Anna-Lena Ekdahl, Jönköping University, Sweden

Children develop an understanding of numbers by, for instance, counting items in smaller or larger sets. When a larger set is placed in a regular arrangement (for example, in rows) subitizing or counting can be used to quantify a subset, and thereby determine the size of the larger set. It becomes more challenging when the items are placed in an irregular arrangement. The aim of this study is to answer the question: How do 6-year-olds estimate and reason about how to determine a quantity of a larger set in an irregular arrangement? In this study, 130 Swedish 6-year-olds were asked: *How many cubes do you think there are on the tray? How could you find out*? looking at a tray with 47 randomly arranged wooden cubes. In the analysis, students' answers were summarized. Codes, inductively sprung from the data, were used to describe students' reasoning. The analysis shows that around half of the students made a reasonable estimation of the number of cubes. In 2/3 of the observations, single-unit counting was in focus in students' reasoning when determining the size of the set of cubes. Whereas in 1/3 of the observations, decomposing the whole collection into subsets, either of the same size (e.g., groups of five) or different size, was in focus in their reasoning. Hence, the study reveals different ways in which 6-years-olds reason about estimating or determining the size of an uncountable set. Based on this, implications for how to teach quantification and estimation are discussed.

Developmental trajectories of initial abilities of children according to socioeconomic status
Keywords: Cognitive Skills and Processes, Mathematics/Numeracy, Primary Education, Reading
Presenting Author: María Victoria Velasco, Pontificia Universidad Católica de Chile, Chile

Executive functions and reading and mathematical skills are fundamental to developing in the social environment. However, not all children have the same conditions for developing these skills; one condition that defines important differences is socioeconomic status (SES). It has been observed that children with a low-SES have a lower development of the skills above. The present study investigates the initial developmental trajectories of these skills to investigate the impact of education on learning. A group of 161 children of different SES was evaluated in language, mathematics, and executive function performance. Parallel trajectories were observed in the case of language and mathematics, and a compensatory trajectory in the case of the development of executive functions. This indicates that, although education has a similar impact on both groups in the case of language and mathematics, the initial differences remain over time. The need to investigate the role of executive functions and the impact of their trajectory is discussed. The need to generate public policies in this regard is raised.

Session E 27

23 August 2023 12:00 - 13:30
UOM_A06
Workshop
Higher Education

A Participatory Workshop Exploring Institutional Gatekeeping in Doctoral Programme Admissions

Keywords: Doctoral Education, Higher Education, Inclusive Education, Researcher Education
Interest group: SIG 24 - Researcher Education and Careers

Prior to making formal applications, potential doctoral students often send academics, programme directors or programme officers informal approaches. Academics often make snap judgements about these inquiries, but, in deciding how to respond, they effectively become gatekeepers to the academic profession. For prospective doctoral applicants, particularly from marginalised social groups and Global South countries, the application process is often challenging to navigate. Previous studies on doctoral recruitment inequalities have focused on formal admissions (Posselt, 2014; Francis et al., 2021; Miller et al., 2019). It is equally vital to understand the pre-application side of admissions (NERC, 2021). Addressing pre-application communications – and the issues therein – is a neglected area of practice in doctoral education. This participatory workshop is underpinned by a research project at the University of Warwick which investigates this area. The workshop is aimed at key stakeholders across doctoral education, including supervisors, doctoral programme directors and programme officers, and those who are working on doctoral education as a research field and/or policy area. The workshop objectives are (i) to map the roles of various stakeholders in the pre-application stage, (ii) to collectively refine understandings of this aspect of doctoral admissions, and (iii) to consider potential channels of action that could ameliorate some of the inequalities that emerge in this stage of doctoral admissions.

A Participatory Workshop Exploring Institutional Gatekeeping in Doctoral Programme Admissions
Presenting Author:- Dangeni, Newcastle University, United Kingdom; **Co-Author:**Sophia Kier-Byfield, University of Warwick, United Kingdom; **Co-Author:**James Burford, University of Warwick, United Kingdom; **Co-Author:**Emily Henderson, University of Warwick, United Kingdom; **Co-Author:**Ahmad Akkad, University of Warwick, United Kingdom

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Session E 28

23 August 2023 12:00 - 13:30
UOM_R05
ICT Demonstration
Learning and Instructional Technology

Mining Digital Learning Data in Education: A Step-by-Step-Guide Using WordPress

Keywords: Artificial Intelligence, E-learning/ Online Learning, Educational Technologies, Learning Analytics
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Please bring your own device if you are attending this ICT demonstration.
Digital learning platforms can present content in many manners and engage students in learning tasks. At the same time, they provide various types of information about student learning by applying Learning Analytics (LA) and Machine Learning (ML; Zhai et al., 2020). Mining educational data includes, for example, the learning behavior of learners by collecting log files about the time-accurate use of each learning resource (Fischer et al., 2020). Conclusions can be drawn from these log files using methods from the field of LA and ML (e.g., Gobert et al., 2013). For this reason, the question arises of how educational researchers can mine data for LA and ML usage to improve teaching-learning processes. In this ICT demonstration, we present an approach to constructing web-based learning platforms for persons without or with little expertise in computer science. Based on the content management system WordPress, we show how to design a web-based learning platform and develop a community-build learning platform together with the participants of the ICT demonstration. Researchers will be enabled to collect log files providing a comprehensive data source for investigating students' learning behavior. The preliminary considerations, prerequisites, implementation, design, and data collection with a self-constructed digital learning platform will be demonstrated and discussed.

We concretized this approach with our own learning platform, which was tested through data collection with 580 learners from the 9^{th} and 10^{th} class and a total of 493,511 data points in science learning.

Mining Digital Learning Data in Education: A Step-by-Step-Guide Using WordPress
Presenting Author: Marvin Roski, Leibniz University of Hannover, Institute for Science Education, Germany; **Co-Author:**Andreas Nehring, Gottfried Wilhelm Leibniz Universität Hannover, Germany

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Session F 1

23 August 2023 14:45 - 16:15
HELEXPO_CC
Invited Symposium

Investigating technology integration in learning activities through the lens of the ICAP model

Keywords: Assessment Methods, Competencies, Digital Literacy and Learning, Educational Technologies, Emotion and Affect, Higher Education, Instructional Design, Large-scale Assessment, Learning Approaches, Meta-analysis, Quantitative Methods, Teacher Professional Development
Interest group: SIG 06 - Instructional Design
Chairperson: Dominik Petko, University of Zurich, Switzerland
Organiser: Alberto Cattaneo, Switzerland
Discussant: Paolo Raviolo, Italy

Digital technologies are often integrated in education to support teaching and learning processes and foster learning outcomes, including knowledge acquisition and competence development. However, the way technology is used by teachers and students in education is determinant for the learning outcomes. According to the interactive, constructive, active and passive (ICAP) model, the cognitive processes underpinning learning become increasingly elaborated from passive to interactive learning activities. Thus, the ICAP model can help to measure and better understand the concept of quality of technology integration in teaching and learning activities. The four studies composing this symposium elaborate from different perspectives on important aspects of applying the ICAP model in the context of technology-enhanced teaching and learning, like the measurement of technology integration, the relationships between learning activities and learning outcomes, and the recommendations on how to effectively use technology in classrooms.The first paper illustrates the results of a systematic review of meta-analyses to compare the effects of technology and non-technology supported learning activities on students' learning. The second paper examines the differences in the frequency of technology integration across qualitatively different learning activities between vocational and general education and depending on the subject matter. The third contribution investigates the effects of different technology-enhanced learning activity on students' outcomes. Finally, the fourth paper explores how technology-related professional development affects high-quality technology-enhanced teaching. The discussant will provide a critical perspective on the application of ICAP model on technology-supported learning activities.

Learning Activities in Technology-enhanced Learning: A Systematic Review of Meta-Analyses
Presenting Author: Michael Sailer, LMU Munich, Germany

The ICAP model postulates that learning activities are an approximation of certain cognitive processes. Further, based on the model, effects of technology-enhanced learning are mediated by the learning activity that is facilitated by technology. In this systematic review of meta-analyses, we examined effects of instruction with versus without digital technology in higher education while considering students' learning activities in the technology and nontechnology conditions. We included N = 29 eligible effects from N = 17 meta-analyses in our systematic review. Our results showed that when digital technology instruction was used as a substitute for nontechnology instruction, there was no significant change in students' learning. However, when the technology provided learning-activity-specific support, learning was fostered. Further, when digital technologies offered more advanced learning activities, we observed a positive impact on students' learning. Our results support the hypothesis that effects of technology-enhanced learning are mediated by the learning activity that is facilitated by technology. Hence, digital technologies can have positive effects on learning in higher education when they incorporate learning-activity-specific support or they offer more advanced learning activities to learners. Further, our results emphasize the crucial role of investigating learning activities from experimental conditions in meta-analyses on technology-enhanced learning in addition to specific technological features.

Integration of Technology in Interactive, Constructive, Active and Passive Learning Activities
Presenting Author: Chiara Antonietti, Swiss Federal University for Vocational Eduation and Training (SFUVET), Switzerland

Since previous research investigating the use of technology in school has focused mainly on the frequency of digital tools used by teachers and students, there is a lack of data about the quality of technology integration in education. With this paper, we aim to investigate how technologies are integrated in teaching and learning activities that entail different levels of learners' cognitive engagement. We developed the 12-item ICAP Technology Scale (ICAP-TS) to measure the quality of technology integration and tested differences between teaching profiles on a sample of 2248 upper secondary teachers (vocational and general education) to investigate the effect of school type and (taught) subjects. Results revealed that teachers use technology to present information and knowledge to students more frequently than to allow them to use technology in an active, constructive, and interactive way. Comparison between teaching profiles also revealed that vocational teachers use technology more frequently than general teachers. In general education schools, the constructive and active use of technology is more frequently reported by teachers teaching humanities and language subjects than science and technology subjects. Our results provide information on how frequently technologies are integrated in upper-secondary schools for different purposes.

Exploring Technology-enhanced Learning Activities in Higher Education and their Effects on Students
Presenting Author: Christina Wekerle, University of Augsburg, Germany

Technology-enhanced university teaching is considered to have great potential to promote learning, especially when instructors stimulate high-quality learning activities such as constructive and interactive learning activities instead of active and passive learning activities (ICAP; Chi & Wylie, 2014). Due to a lack of empirical studies in authentic, technology-enhanced instructional settings, we investigated the cognitive and affectivemotivational effects of these learning activity modes in authentic, technology-enhanced higher education courses with a sample of 87 higher education teachers and 3820 students in 170 university courses. The results highlight the importance of technology-enhanced interactive learning activities for students' knowledge gain and the potential negative consequences of passive learning activities for affective-motivational outcomes. However, the superiority of constructive and interactive learning activities compared to passive and active learning activities for cognitive and affective-motivational outcomes was not supported by the findings. Instead, the findings point to potential differential effects of the individual learning activities within one activity mode.

How to Promote High-Quality Technology-Enhanced Teaching Through Teacher Professional Development?
Presenting Author: Tim Fütterer, University of Tübingen, Germany

The effectiveness of technology in teaching depends on the quality of how teachers implement it. Professional development (PD) is a promising approach to promote teachers' knowledge (e.g., technological pedagogical knowledge [TPK]) and skills (e.g., planning and conducting lessons) that are necessary to be able to integrate technology into teaching in a high-quality way. However, up to now, insights into the importance of teachers' cognitive (e.g., technological [TK], pedagogical-psychological [PK] knowledge) and motivational (e.g., self-efficacy) prerequisites, different PD approaches (e.g., integrative vs. transformative), as well their interplay for PD effectiveness are missing. We used data from N = 255 teachers who participated in a three-month PD program to promote their TPK and skills to conduct high-quality technology-enhanced teaching. We randomly assigned teachers to a TPKintegrative (utilizing the Replacement, Amplification, and Transformation [RAT] framework) or a TPK-transformative (utilizing the ICAP framework) PD intervention. We assessed teachers' TK, PK, TPK, self-efficacy and teaching quality at three measurement points (pretest, posttest, follow-up). Findings from baseline latent change models indicated that both PD interventions did not change teachers' tested TPK but increased their self-efficacy in the short and in long term. Regarding TPK, teachers with less PK and regarding selfefficacy teachers with more TK at the pretest benefited more in both PD interventions while teaching quality increased in the long term. Teachers in the TPK-transformative PD intervention with higher TK particularly benefited in the short and long term. Results can help to design effective and differentiated PD programs to prepare teachers for highquality technology-enhanced teaching.

Session F 2

23 August 2023 14:45 - 16:15
UOM_CH
Invited Symposium
Culture, Morality, Religion and Education

Religions and worldviews in education providing hope of social sustainability

Keywords: Attitudes and Beliefs, Cultural Diversity in School, Curriculum Development, Digital Literacy and Learning, Environmental Education, Ethics, Morality and Moral Development, Religiosity and Spirituality, Social Aspects of Learning and Teaching, Sustainable Development, Well-being

Interest group: SIG 19 - Religions and Worldviews in Education
Chairperson: Martin Ubani, University of Eastern Finland, Finland
Organiser: Martin Ubani, University of Eastern Finland, Finland
Organiser: Alexander Unser, TU Dortmund University, Germany
Organiser: Sarah Delling, University Siegen, Germany
Discussant: VASILIKI MITROPOULOU, Greece

This symposium discusses through fresh studies how education about religions and worldviews can contribute in the promotion of social sustainability. Arguably, the purpose and mission of education is to ensure that all students can benefit from learning so that they are able to 'participate fully in public, community and economic life' (NLG 1996). Many times in political documents and policy recommendations education is portrayed as the principal answer to many challenges (Niemi 2021). Poverty, the in-equal distribution of resources, is one of the 'wicked' and 'persistent' problems of humankind and includes, for instance, physical, psychological, social and also educational consequences (Comber 2015). It is usually agreed that the concept 'sustainable development' includes bio-physical/environmental, economic, and social sustainability (Vallance, Perkins & Dixon 2011; Dillard, Dujon & Brennan 2013). The emergence of 'social sustainability' in public consciousness can be traced to the UN General Assembly (1983) that aimed for initiatives that lead 'to the achievement of common and mutually supportive objectives which take account of the interrelationships between people, resources, environment and development'. We argue that education about religions and worldviews can contribute in the promotion of social sustainability. According to Jenkins the 'transition toward sustainability requires engagement with the religious symbols that shape a global moral consciousness'. As religions have significantly shaped the cultural roots of sustainability problems we need to critique and reform the elements of religion that contribute to unsustainable worldviews (Jenkins 2008) in education and research. With these 4 presentations we wish to further this process.

Theologies, Religion and Literacy: Towards Socially Sustainable Religious Education?
Presenting Author: Martin Ubani, University of Eastern Finland, Finland

With this theoretical presentation I discuss the question of the place of religious literacy in the social sustainable development framework. The presentation first discusses the concept of literacy and argues how the spreading of literacy in societies has included aspects related to, on the one hand, worldview and value development and, on the other hand, individual social empowerment and grander socio-cultural change, and how these aspects should also present standards for religious literacy today. Social sustainability has been attributed elements such as inclusivity, impartiality, meaning making and also cohesion of 'textures' of society through common values, mutual understanding and shared cultural memory. The presentation maintains that religious literacy as a critical skill is essential for promoting socially sustainable development that not only acknowledges the role of religion in, for instance, society and culture (i.e., to be able to 'read', to be literate) but also involves the knowledge, skills and attitudes related to religion in public exchange (i.e., to be able to act literate). Finally, the presentation concludes with implications for religious education in public schools.

A digital response-tool to grasp personal orientations underlying sustainability conflicts
Presenting Author: Stefan Altmeyer, Johannes Gutenberg University Mainz, Germany

While there is a broad consensus that education in general as well as religious education should contribute to the goals of education for sustainable development (ESD), it remains largely unexplored how it should achieve the intended goals. This becomes even more critical as empirical studies have repeatedly shown that the goals of education for ecological sustainability are as indispensable as they are difficult to achieve. In particular, the discrepancy between sustainability awareness and everyday actions seems to be particularly large and strongly dependent on personal factors. Against this background, the paper argues that the evaluation of everyday sustainability conflicts should be considered; it aims to show how underlying personal orientations can be identified and educationally addressed. The main attention will be on the so-called "poplar dilemma tool", a digital response-tool that focuses on an everyday sustainability dilemma and its evaluation. Being developed and tested in an empirical study among more than 1,100 secondary school students in Germany and Austria, the use of this instrument allows for the identification of five types of personal orientations, each of which is characterized by a typical evaluation pattern. The paper concludes that the poplar dilemma is applicable to educational practice as classroom tool, to develop teaching programmes that can deal with personal predispositions in an appropriate and differentiating manner.

Diversity as an Element of Social Cohesion – the Findings of an Empirical Research
Presenting Author: Eszter Kodacsy-Simon, Lutheran Theological University in Budapest, Hungary; **Co-Author:**Etelka Seres-Busi, Lutheran Theological University in Budapest, Hungary

The issue of fragmentation is a clearly visible and observable phenomenon in Hungary that can be seen in a number of issues emerging in our society. For several decades, the role of church schools and their processes of value transmission have also come to the fore from time to time, both as a legitimation dilemma from outside and as an identity dilemma from within.From time to time, the voice of students is also explored, but there is an under-representation of studies and research on the school experiences of students in church schools.Present exploratory research interviewed 37 students from church schools with different backgrounds. In our analysis, we will discuss1. the ways in which certain concepts (society, nation, community) appear in students' responses, and the associations they make to these concepts;2. how they interpret concepts (for example power, responsibility, norms) that determine both public discourse and social perception, and how they make this "tangible" in relation to school stories;3. which elements (re-creating and reinterpreting traditions, rules, shaping personal beliefs, etc.) and prosocial values they identify as personal resources that can later promote their integration and participation in society and help achieve social cohesion.In the analysis the aspect of "diversity" emerged as a core concept among the codes, mentioned by students as a factor activating their personal resources, for example in dealing with life issues or shaping their own worldview and beliefs. The presentation will show the connections between the core concept, the meanings students give to it, and the barriers students perceive.

Existential Resilience and Well-being, Hope and Meaning: Cultivating Existential Sustainability
Presenting Author: Arniika Kuusisto, University of Helsinki, Finland

This paper approaches existential resilience and well-being, education for hope and meaning, through arguing for cultivating of existential sustainability in education. The topic is approached both through theoretical and conceptual literature and empirical extracts from data constructed by young children (N=42; ages 3-8) through digital audio-visual tools, on what they find personally important and valuable. Resilience can be seen "at the heart of existentialism", "opening new roads for multidisciplinary research on existential resilience" (Vos 2015). Through existential perspective to resilience and well-being, it is here examined as an existential query to coping with difficult life situations (ibid.), finding hope and meaning. At present, the pandemic, climate crisis, and global turmoil have contributed to many children's existential anxiety. Their coping is critically linked with the support, or lack thereof, for resilience resources (Koirikivi et al, 2021)—with potential implications into worldview education.

Session F 3

23 August 2023 14:45 - 16:15
UOM_R08
Symposium
Teaching and Teacher Education

Examining the Validity of Standardized Approaches to Measuring Teaching Quality

Keywords: Assessment Methods, In-service Teachers, Quantitative Methods, School Effectiveness, Social Aspects of Learning and Teaching, Teacher Effectiveness, Teacher Professional Development, Teaching Approaches, Teaching/Instructional Strategies
Interest group: SIG 18 - Educational Effectiveness and Improvement
Chairperson: Mark WHite, University of Oslo, Norway
Discussant: Anna-Katharina Praetorius, University of Zurich, Switzerland

Measuring teaching quality is highly complex. Variation in instructional practices across time, students, content, and other features must be accounted for in the measurement of teaching quality. Further, common tools for measuring teaching quality rely on students' ability to self-report on their own experiences, or on raters' ability to carefully observe and interpret instructional practice according to rubric guidelines. This variability in the object of measurement (i.e., instruction) and the filtering of measurement through individual reporters creates challenges in trying to measure and study teaching quality. These (and other) challenges create the need to carefully study the validity of different approaches to measuring teaching quality. This symposium does exactly that. The first paper uses survey measures of teaching quality to examine the context sensitivity of measures, illuminating differences in the measurement of teaching quality between in-person and distance learning. The second paper shows that survey measures do not always capture their intended constructs and different measures of teaching quality do not always agree, raising questions about how to triangulate teaching quality across sources. The third paper looks at the impact of training teachers to observe teaching quality, showing positive impacts of such training, but raising questions about whether even trained teachers can discriminate across different dimensions of teaching quality. The last paper introduces an approach to explore the robustness of study conclusions to the observed levels of rater error. Across these studies, we see the validity of measures of teaching quality being investigated, often with mixed results.

Students' Perceptions of Teaching Quality in In-person Classrooms and Distance Education
Presenting Author: Ann-Kathrin Jaekel, University of Tuebingen, Germany; **Co-Author:**Richard Goellner, University of Tuebingen, Germany

The importance of teaching quality for student learning has been widely studied. However, empirical models focus on school-based in-person teaching. Studies focused on comparing students' perceptions across learning environments could not draw clear comparisons due to several other influencing factors. Therefore, it is unclear whether students perceive learning in in-person and in distance environments differently and if teaching quality dimensions are differently associated with students' learning outcomes. This study addresses this gap in research and compares students' perceived teaching quality in both learning settings as well as the associations with students' motivation. Specifically, we investigated whether and to what extent student perceptions of different quality dimensions (monitoring, support, and challenging tasks) result in an invariant measurement of teaching quality for the two learning settings. In addition, we tested for differences in the mean values and associations between students perceived teaching quality and their learning motivation. Therefore, we used data of two large studies assessing teaching quality before and during the school closures in 2019 and 2020. The results showed that the used scales were comparable across learning settings. Thereby, challenging tasks were perceived to be more pronounced for distance education than for in-person education, whereas monitoring and support showed higher mean values for in-person learning. A similar pattern was found for associations with students' motivation: The correlations for challenging tasks with students' motivation were higher in distance learning than in in-person teaching and learning. These results show the exceptional role of the provision of challenging tasks in distance education settings.

Student Perceptions as Indicator of Teaching Quality: A Report from Nordic Classrooms
Presenting Author: Berglind Gisladottir, University of Iceland School of Education, Iceland; **Co-Author:**Michael Tengberg, Karlstad University, Sweden; **Co-Author:**Astrid Roe, University of Oslo, Faculty of Education, Norway; **Co-Author:**Anders Stig Christensen, UCL University College, Denmark, Denmark

This study investigates student perceptions as indicator of teaching quality in lower secondary classrooms. It draws on survey data from Denmark, Finland, Iceland, Norway, and Sweden, targeting the students' evaluations of instructional practices in language arts, mathematics, and social science. The aim of the study is both to compare patterns of instructional practices across countries and subjects, and to explore validity aspects of student responses as indicator of teaching quality.Nearly 2,000 students in the five Nordic countries responded to the Tripod Survey in three different subjects. The survey contains 38 items, expected to measure seven different domains of instruction. Descriptive statistics, factor analyses, ICC, and Pearson correlations were combined in the study. Findings reveal mainly converging response patterns in the five countries, although a few significant differences appear, suggesting country-specific traits of the instruction. Students in the Nordic countries generally rate their teachers as caring and attentive, but less prone to share responsibility for planning classroom activities with the students. In line with previous research, however, the seven-factor structure of Tripod is only weakly supported by fit values.Alternative structures of the data are explored and discussed, including a three-factor model and a bifactor model. Bivariate analyses suggest that aggregated survey estimates of teaching quality are only weakly related to aggregated estimates from classroom observations, but that a few domain-specific estimates, such as classroom management, relate strongly between surveys and observations.

Classroom Observation Ratings of Teaching Quality – An Investigation of a Teacher Training
Presenting Author: Tosca Daltoè, University of Tübingen, Germany; **Co-Author:**Julia Maier, University of Tübingen, Germany; **Co-Author:**Evelin Ruth-Herbein, University of Tübingen, Germany; **Co-Author:**Richard Goellner, University of Tuebingen, Germany; **Co-Author:**Ulrich Trautwein, University of Tübingen, Germany; **Co-Author:**Benjamin Caspar Fauth, University of Tübingen, Germany

Classroom observation is widely used to provide feedback on teaching quality. However, observing and assessing teaching quality is challenging even for experienced teachers. For this reason, rater trainings using classroom videos to represent teaching practice aim to prepare teachers in providing satisfactory observation ratings of teaching quality. In the context of a rater training for a newly developed classroom observation form (Fauth et al., 2022) we investigated the psychometric quality of observation ratings of teaching quality in classroom videos in two studies. In Study 1, $N = 10$ teachers were trained in rating teaching quality using the observation form. The teachers rated classroom videos of the TALIS video study over the course of the training. We investigated interrater agreement and interrater reliability of the resulting teaching quality ratings. Results indicated mostly satisfactory teaching quality ratings after the rater training with clear differences between the items, depending on the teaching quality aspect assessed. Study 2 was conducted with the same sample of teachers after the rater training. Teachers rated 34 classroom videos of the Pythagoras study. We investigated construct validity of the resulting teaching quality ratings. Results provide evidence for convergent validity but limited discriminant validity of the observation ratings. We discuss the results and limitations of the present investigation, taking into account current considerations on validity arguments for classroom observation systems.

Evaluating the Robustness of Observational Studies' Results to Rater Error with a Linking Data Set
Presenting Author: Mark WHite, University of Oslo, Norway

Rater error is a serious threat to conclusions from observational research on teaching quality. This is especially true for cross-country research where raters are often nested within countries, making it difficult to use standard approaches for examining rater agreement. This paper introduces a new approach to examine rater error in cases where raters are nested within country. This approach focuses on incorporating uncertainty due to rater error into study conclusions, allowing for an examination of how robust study conclusions are to rater error. The approach creates a linking data set by "master scoring" a set of videos from each country. The linking data set is used to calibrate a hierarchical rater model that nests raters as items within observation rubric dimension scores. The hierarchical rater model is then applied to the full data set to estimate scores that are adjusted for rater effects or the model is embedded within a larger model to examine research questions. I demonstrate an application of this approach to the LISA Nordic data set, which collected videos of 390 lessons across the five Nordic countries. This application shows the importance of accounting for rater error.

Session F 4

23 August 2023 14:45 - 16:15
AUTH_TE2
Symposium
Instructional Design

Bringing journal writing, learning by explaining, peer-tutoring in a dialogue

Keywords: Cognitive Skills and Processes, Metacognition, Peer Interaction, Self-regulated Learning and Behaviour, Teaching/Instructional Strategies, Writing/Literacy
Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Ai Miyamoto, University of Freiburg, Germany
Organiser: Ai Miyamoto, University of Freiburg, Germany

Discussant: Vincent Hoogerheide, Utrecht University, Netherlands

Journal writing, learning by explaining, and peer tutoring are all established learning methods for facilitating students' generative learning. The aim of this symposium is to introduce different generative learning methods and discuss similarities and differences in their effectiveness on students' learning strategy use and comprehension. The first presenter investigates the effectiveness of journal writing on learning strategy use and comprehension, with a particular focus on the effects of prompts as instructional support, among teacher university students in Germany. The second presenter examines the effectiveness of journal writing on students' learning strategy use and comprehension among secondary school students in Germany. His study focuses on the role of medium (oral vs. written) in addition to prompts in influencing the effectiveness of journal writing. The third presenter also investigates the role of medium (oral vs. written) and prompts in the effectiveness of learning by explaining on secondary school students' learning strategy use and comprehension. The fourth presenter examines the effectiveness of peer tutoring on students' learning strategy use and comprehension among high school students in Japan. All presenters conducted field experiments in a classroom setting. We will discuss similarities and differences in the effectiveness of different generative learning methods. This symposium is relevant to educational researchers and practitioners as it provides important and practical insights into how different kinds of generative learning activities can be effectively implemented in the classroom in order to foster students' learning processes and outcomes.

Digital journal writing: Cognitive, but not metacognitive prompts enhance comprehension and transfer
Presenting Author: Veit Kubik, University of Würzburg, Germany; **Co-Author:**Markus H. Hefter, Bielefeld University, Germany; **Co-Author:**Matthias Nückles, University of Freiburg, Germany; **Co-Author:**Kirsten Berthold, University of Bielefeld, Germany

Journal writing is an effective generative learning activity when prompts are provided as instructional support. In this experimental field study, we tested the effectiveness of cognitive and metacognitive prompts to elicit participants' strategy use and in turn to enhance their comprehension after 1 week in an authentic educational setting of a digital university lecture. Student teachers ($N = 97$) watched a university lecture about *Piaget and his Theory of Cognitive Development* and were subsequently instructed to write a learning journal using a digital learning environment. Following the opportunity to revise their learning journals, students received a posttest after 1 week. The preliminary results showed that the prompts fostered the application of the targeted cognitive and metacognitive learning strategies. Importantly, we observed a main effect of prompt type on the learning outcome, indicating that prompts supported student teachers' self-regulated learning. More specifically, contrast analyses showed that cognitive prompts, but not metacognitive prompts, enhanced comprehension despite the opportunity to revise learning journals (Nückles et al., 2009). The benefit of cognitive prompts was mediated by the frequency of participants' use of elaboration strategies, however, not by organization strategies and students' perceptions of germane cognitive load. One possible reason that metacognitive prompts were not instructionally effective may be the additional affordances that come with self-regulated learning in digital, unsupervised environments at home as compared to in the traditional, lab-based setting. Complementary support measures are needed to make metacognitive prompts effective in digital learning environments, such as informed training and example-based video instructions.

Writing or speaking? The role of medium in the effectiveness of learning journals
Presenting Author: Florian Luft, University of Freiburg, Germany; **Co-Author:**Ai Miyamoto, University of Freiburg, Germany; **Co-Author:**Matthias Nückles, University of Freiburg, Germany

Journal writing is an established learning method to facilitate the effective use of cognitive and metacognitive learning strategies and subsequent learning outcomes. In addition, recent studies suggest that similar learning processes and outcomes may be also possible in the medium of oral speech. Thus, the aim of the present study is to investigate the role of the medium (written vs. oral) in the effectiveness of learning journals on students' learning strategy use and learning outcomes. In our randomized controlled field experiment, secondary school students ($N = 163$) first watched a video lecture on a psychological topic and were then randomly assigned to experimental conditions in which they made a learning journal entry either in a written or oral format, or restudied the learned material. Students in the experimental groups then revised their learning journals using the transcribed texts, while the restudy group kept reading the texts. All students took a knowledge test after one day and after seven days. The results showed that spoken learning journals led to significantly higher learning outcomes than written learning journals in the post-test and follow-up test. The mediation analyses further revealed that the effect of the medium on learning outcomes was explained by the use of cognitive and metacognitive strategies. Our findings suggest that students benefit more from spoken learning journals than written learning journals because of more cognitive and metacognitive strategies they use while learning, possibly due to the lower production and formulation cost of oral speech compared to the act of writing.

The role of prompts and medium in the effects of learning by explaining on students' comprehension
Presenting Author: Ai Miyamoto, University of Freiburg, Germany; **Co-Author:**Matthias Nückles, University of Freiburg, Germany

Learning by explaining is an effective learning method to facilitate students' generative learning. In this experiment, we investigated the differential effects of the medium of explaining (written vs. oral) and instructional support (i.e., prompts) on students' learning outcomes. Secondary school students in south Germany first watched an instructional video and learned about a psychological theory (cognitive load theory). They were randomly assigned to either experimental conditions in which students produced an explanation to a fictitious peer in a written or oral format (with or without prompts) or restudied the learned material. Afterward, students in experimental conditions had a chance to revise their explanations, while students in a control condition continued to restudy the learned material. All students took a knowledge test after one day (post-test) and seven days (followed-up test). The preliminary results showed no main effect of experimental conditions on students' conceptual and transfer knowledge in both post-test and follow-up tests while controlling for students' prior knowledge and school grades. However, there was a marginally significant main effect of the medium, indicating that students who produced oral explanations showed higher conceptual and transfer knowledge compared to students who produced written explanations. There was no main effect of prompts. One possible reason for the superiority of oral explanations over written explanations could be the higher feeling of social presence for the oral conditions, which triggers more generative and elaborative processes during explaining. Another possibility is the higher extraneous load in the written than the oral condition.

Effects of a high school peer-tutoring program on students' understanding and learning strategy use
Presenting Author: Tatsushi Fukaya, Hiroshima University, Japan

Peer-tutoring might promote not only deeper comprehension of subjects, but also everyday use of effective learning strategies. The purpose of this study was to develop an effective peer-tutoring program and evaluate its effects. 320 public high school students participated in the program which consisted of lectures and actual peer-tutoring. The program consisted of four hours of classes (50 min. x 4). The first class was an introduction to effective tutoring. In the second class, the first tutoring activity was conducted with scaffoldings to improve the quality of tutoring. In the third class, students were asked to reflect on the first lesson. In the fourth class, we conducted the second tutoring activity, with less scaffolding than in the first tutoring. Before and after the program, a questionnaire survey was administered that included a test to understand the content covered in the first tutoring activity and questions about learning strategies. For the learning strategy, delayed measurements were also conducted 2 months after the program. The results of the analysis showed that comprehension scores for the subject contents increased from pre- to post-tutoring. The post-measurement was taken approximately one month after the first tutoring session, suggesting that tutoring promoted a deeper understanding of students. In addition, the use of learning strategies such as checking one's own understanding by giving explanations improved from pre- to post-tutoring, and this improvement was maintained in the delayed measurement taken two months after the program.

Session F 5

23 August 2023 14:45 - 16:15
AUTH_DC2
Symposium
Higher Education

Challenging the narrow definitions of diverse students' sense of belonging in higher education

Keywords: Educational Attainment, Higher Education, Inclusive Education, Migrant / Refugee and Minority students, Mixed-method Research, Peer Interaction, Pre-service Teachers, Sustainable Development

Interest group: SIG 04 - Higher Education
Chairperson: Pieter van Lamoen, Erasmus University Rotterdam, the Netherlands, Netherlands
Organiser: Aike Dias-Broens, Erasmus University Rotterdam, Netherlands
Discussant: Kim Ouwehand, Erasmus University Rotterdam, Netherlands

Evidence suggests that developing a sense of belonging is positively related to emotional wellbeing, academic motivation and success in higher education. With the massification of higher education and the diversification of the student population, it is essential to challenge the existing narrow definitions of sense of belonging. In this symposium, we will challenge these definitions from multiple viewpoints. In presentation 1, the body of literature about the conceptualizations and measurements of sense of belonging in higher education will be discussed. This includes a discussion on how and if these (narrow) conceptualizations and measures take students' ethnicity and generation status in higher education into account. Afterwards, three studies will be presented where the (narrow) definitions of sense of belonging are challenged by discussing results based on empirical research with higher education students. In presentation 2, first year undergraduate students' understanding of their own belonging needs - and how this connects to subsequent levels of belonging - is investigated through a mixed methods action research study across two English universities. Furthermore, presentation 3 also focuses on the first year experience and zooms in on the sense of belonging of an often underrepresented group of students, namely mature first-generation students, who follow a teacher education program. Finally, in the 4th presentation, the perspective and experience of students who feel a low sense of belonging and decide to drop out early is discussed.

A systematic literature review about the sense of belonging of diverse students in higher education
Presenting Author: Aike Dias-Broens, Erasmus University Rotterdam, Netherlands; **Co-Author:**Marieke Meeuwisse, Erasmus University Rotterdam, Netherlands; **Co-Author:**Sabne Severiens, Erasmus University Rotterdam, Netherlands

Sense of belonging in higher education plays an important role in the academic attainment of students in higher education. It is worrisome that first-generation students and ethnic minority students feel a lower sense of belonging in higher education compared to their peers. Therefore, in this systematic review we investigated 1) how the sense of belonging of students in higher education is conceptualised and measured, and 2) how these conceptualizations and measures differ in studies based on students' ethnicity and generation status in higher education. The systematic review included 150 quantitative, qualitative and mixed method articles published between 2000 and 2021. The quality of the included articles was appraised and the articles were analysed through an integrative approach. Results revealed the following concerns: 1) the used conceptualizations were extensive and varied greatly, and this concern was also found in the measures as 52 different measures for sense of belonging in higher education were used, 2) multiple conceptualizations from (diverse) students in qualitative studies were not included in conceptualizations in quantitative studies, 3) there was a misalignment between the conceptualizations and measures used, and 4) there was missing psychometric investigation into the validity and measurement invariance of sense of belonging for (diverse) student populations in higher education. These results are important and can be used to determine a more fitting conceptualization and measure of sense of belonging for a diverse student population in higher education.

An action research approach to challenging narrow conceptions of belonging amongst students
Presenting Author: David Gilani, Middlesex University, United Kingdom

An ever-expanding body of research and practice within higher education has seen increased provision of opportunities to help students build belonging. This is not without purpose, given the close links between belonging and student outcomes - e.g. continuation rates. This research argues for and explores a missing element: helping students to understand their individual belonging needs, challenge narrow definitions and subsequently act to build authentic belonging. This is especially important, given repeated research suggesting that it is students from disadvantaged backgrounds who tend to have lower levels of belonging. Based on a sample of approximately 80 new undergraduate students from two English Higher Education institutions, this mixed-methods approach investigates how two different types of workshops – one focused on study skills and another on the topic of belonging – can help students to understand their own needs. Quantitative aspects of the research focus on how belonging levels change across students' first year of study using the Yorke belonging scale, whilst the qualitative parts of the research centre around students' contributions to a longitudinal online diary.Results will centre around the extent to which workshop interventions enhance first year undergraduate students' understanding of their own belonging needs and eventual levels of actualised belonging, as well as the actions students take to build authentic belonging.

Mature student belonging in teacher education: we're fine because you don't feel you are by yourself
Presenting Author: Karina Ryan, Mary Immaculate College, Ireland

This paper will share access practitioner insights on the theme of belonging in higher education. These insights form part of a larger collaborative research project with mature first-generation students participating on an initial teacher education programme. Evidence strongly suggests that mature students often struggle with belonging as they transition into higher education. These struggles with belonging are particularly apparent amongst under-represented groups in teacher education in Ireland where teaching is predominantly a middle-class profession. While the theme of belonging arose frequently throughout the study, belonging did not emerge as an unproblematic concept or one that is easily defined or universally achievable. Instead, belonging, as experienced by the participants, was complex, protracted, and primarily relational in nature. As the year progressed, the participants grew in confidence and found ways of experiencing belonging and student teacher identities. They also drew heavily on and, contributed in turn, to the peer group support which was an important part of this alternative belonging experience. The findings suggest that, for mature ITE students a sense of belonging, which aligns with and even celebrates their mature and first-generation entrant identities, can be greatly enhanced through supports collaboratively developed and delivered within a framework of care.

Student sense of belonging and early dropout – how are they related?
Presenting Author: Claudia Gomes, Rotterdam University of Applied Sciences, Netherlands

Although higher education has become more accessible and inclusive for students of all social, cultural and educational backgrounds, not all students reach their academic goal. Belonging is critical to first-year student success and persistence in higher education. In the freshman year students make the transition to higher education and need to find a new sense of belonging. The foundation for sense of belonging is laid in the freshman year and plays an important part in the academic outcome of first year students, especially in the liminal phase of the transition and in the student's ability to integrate into the life of the institution. Student sense of belonging is related to early drop out in the propaedeutic year. The aim of the study was to gain a better understanding of the underlying factors of student sense of belonging and how these relate to early drop out. Students were recruited to participate in an online quantitative survey (N = 1745). The findings suggest that quality of relationships with peers, staff, and identification with the institution play an important role in students' sense of belonging and early drop out.

Session F 6

23 August 2023 14:45 - 16:15
AUTH_DC1
Symposium
Educational Policy and Systems

Research on predictors of grade retention in Europe: State of the art

Keywords: At-risk Students, Attitudes and Beliefs, Developmental Processes, Educational Policy, Meta-analysis, Parents' Beliefs and Affect, Primary Education, Secondary Education, Teaching/Instructional Strategies
Interest group: SIG 18 - Educational Effectiveness and Improvement
Chairperson: Mieke Goos, Belgium
Discussant: Barbara Belfi, Maastricht University School of Business and Economics, Netherlands

A lot of research has been done on grade retention, in many countries around the world, showing this practice to be non-effective and highly unfair, tackling low-

SES students, ethnic minority students, and disabled students in particular (Goos et al., 2021; Valbuena et al., 2020). Much less is known about predictors of grade retention at the parent, teacher, class and school team level. Which characteristics increase students' risk of being retained in grade? Which types of teachers apply grade retention more often? Our symposium tries to answer these questions, via a literature review and 3 empirical studies conducted in Luxembourg, Belgium, and Portugal (see Table 1). Our symposium closes with a discussion linking our results to educational policy and practice. Table 1*Descriptive characteristics of the 4 symposium studies* Study Country Data Method 1 Europe / Literature review 2 Luxembourg Data of the Luxembourgish Ministry of Education Empirical study (multilevel regression analysis) 3 Belgium SiBO longitudinal study Empirical study (multilevel regression analysis) 4 Portugal Data of Madeira primary schools Empirical study (path analysis) References Goos, M., Pipa, J., & Peixoto, F. (2021). Effectiveness of grade retention: A systematic review and meta-analysis. *Educational Research Review, 34*, 100401. doi: 10.1016/j.edurev.2021.100401 Valbuena, J., Mediavilla, M., Choi, Á., & Gil, M. (2021). Effects of grade retention policies: A literature review of empirical studies applying causal inference. *Journal of Economic Surveys, 35*(2), 408-451. doi: 10.1111/joes.12406

Do parental educational aspirations protect against grade retention?
Presenting Author: Florian Klapproth, Medical School Berlin, Germany; **Co-Author:**Fabian Meissner, Medical School Berlin, Germany; **Co-Author:**Antoine Fischbach, Luxembourg Centre for Educational Testing, Luxembourg

Based on longitudinal data from 38,176 students enrolled in Luxembourgish secondary schools, we examined whether parental educational aspirations are negatively related to students' likelihood of retention in grade 8. Moreover, we investigated whether this relationship is moderated by parents' immigration status. By using 2-level logistic regression analysis, we could show that parental educational aspirations are indeed a significant predictor of students' likelihood of being retained in grade 8, even when students' achievement (represented by grade point average) and students' secondary school track are controlled for. Students whose parents had high educational aspirations were less prone for grade retention than students whose parents had low educational aspirations. A moderation effect of parents' immigration status was not found. The results obtained are discussed with regard to the importance of family background for educational success.

Which teacher, class and school characteristics predict Flemish teachers' grade retention beliefs?
Presenting Author: Mieke Goos, KULeuven + UCLL, Belgium; **Co-Author:**Elke Londers, UCLL, Belgium

This study aims to unravel which teacher, class and school characteristics are related to Flemish primary school teachers' grade retention beliefs. For this purpose, data from 857 teachers, 109 principals, and 3885 students from 121 Flemish primary schools were used. Two-level linear regression analysis was used to detect characteristics predicting teachers' beliefs about the effectiveness of grade retention. Flemish primary school teachers, on average, appeared to have rather positive beliefs about grade retention effectiveness. Grade, teaching in a multiple-age-class, class math achievement heterogeneity, and school team grade retention beliefs seemed to matter in this regard, demonstrating the importance of both personal professional experiences and teachers' immediate environment in shaping their beliefs.

Are teacher beliefs about interventions promoting student success related with grade retention?
Presenting Author: Natalie de Nóbrega dos Santos, ISPA-Instituto Universitário, Portugal; **Co-Author:**Vera Monteiro, ISPA- Istituto Universitário, Portugal

A complex and multifaceted belief system influences teachers' professional practices. The present study sought to understand primary school teachers' beliefs about the effectiveness and difficulty of implementing various interventions, including grade retention, to promote the academic success of struggling second-grade students. Additionally, we sought to understand the relationship between these beliefs and teachers' grade retention practices. Two hundred seventy-three primary school teachers from the Region of Madeira, Portugal, completed an online questionnaire designed for this purpose. The results indicated that teachers consider grade retention to be ineffective, compared to other interventions, but still moderately helpful in preventing school failure. Individual instruction, smaller class sizes and differentiated instruction were considered the more effective interventions. Teachers also found grade retention easier to implement than family involvement and psycho-pedagogical support. A path analysis indicated that teachers who believed more in the effectiveness of grade retention and one-on-one instruction and considered it more challenging to promote social-emotional skills retained more students the last time they taught second grade. The results suggest the importance of developing pedagogical differentiation strategies, promoting socio-emotional skills and supporting family involvement, during teachers' initial training and career, that is, three interventions that will have a greater possibility of reducing the use of grade retention and promoting school success among struggling students.

The predictors of grade retention in Europe: A systematic review
Presenting Author: Joana Pipa, ISPA - Instituto Universitário | Center for Research in Education, Portugal; **Co-Author:**Sérgio Gaitas, ISPA-Instituto Universitário / CIE - ISPA (Center for Research in Education), Portugal; **Co-Author:**Francisco Peixoto, ISPA - Instituto Universitário | Center for Research in Education, Portugal

Research on grade retention has a long tradition and remains a hot topic in educational research and practice, especially given the debate around the complexity of its effects. In addition, studies have revealed that grade retention does not affect students equally, showing the existence of several factors predicting the likelihood of grade retention. However, a systematic approach summarizing the literature regarding the predictors of grade retention is still missing. This study aims to summarize the research findings of recent European studies investigating the predictors of retention in grades K-12. More specifically, this study aims to identify factors at the student, teacher, classroom, school and region/country level that have an impact on students' grade retention status. Based on our search strategy and selection criteria, 32 studies were identified. Overall, our findings indicate that students' characteristics have been examined most often, demonstrating their predictive value for grade retention. These findings suggest the need for changing the paradigm of studying grade retention predictors only in the light of student characteristics, to explore the contribution of other factors, such as teaching practices and classroom and school organization. Changing this paradigm would strongly contribute to changing grade retention policies and practices.

Session F 7

23 August 2023 14:45 - 16:15
AUTH_T002
Symposium
Teaching and Teacher Education

Teacher interventions on learning interaction in the classroom

Keywords: Classroom Management, Engagement, In-service Teachers, Pre-service Teachers, Primary Education, Teacher Professional Development, Teaching/Instructional Strategies, Well-being
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland
Organiser: Sigrun K. Ertesvag, University of Stavanger, Norway
Discussant: Pamela Sammons (Greet), University of Oxford, United Kingdom

A substantial body of evidence exists on the importance of learning interactions between teachers and students in promoting students' engagement and learning. Learning interactions holds the most promise for intervention efforts seeking to improve student engagement and learning because, unlike many individual and family factors, they are malleable and open to improvement by the school community. Accordingly, there is a need for research-based initiatives to develop learning interactions both in teacher training and in schools to provide a career-long focus on the development and improvement of learning interactions. This symposium presents initiatives to support teacher students' and teachers' development of learning interaction skills in Norway, Finland, and Sweden. The first paper investigates students' understandings and expressions of learning interaction from their first practice period, the first year of teacher education. Knowledge about teacher students' early understandings and expressions of learning interactions is important to better understand and support teacher students' development of learning interaction in teacher education and future interventions. The second paper presents a model for prospective

teachers' systematic development of learning interaction skills. This innovative approach to teacher training addresses the development of learning interactions in practice periods throughout the teacher training. The third and fourth papers present two initiatives to develop teachers' didactic learning interaction (third paper) and generic learning interactions (fourth paper). Taken together the four papers illustrate how pre- and in-service training can support teachers' career-long development of learning interaction. The studies also address the role of systematic observation in interventions to improve learning interactions.

Beginning teacher students' understandings and expressions of classroom management
Presenting Author: Karin Street, Western Norway University of Applied Sciences, Norway; **Co-Author:**Sigrun K. Ertesvag, University of Stavanger, Norway; **Co-Author:**Siv Måseidvåg Gamlem, Volda University College, Norway; **Co-Author:**Linda Moen Rebni, Western Norway University of Applied Sciences, Norway; **Co-Author:**Randi M. Sølvik, Universty of Stavanger, Norway; **Co-Author:**Grete Sørensen Vaaland, University of Stavanger, Norway

Although classroom management is seen as central to supporting students' learning and development, little is known regarding teacher students' initial and developing classroom management during teacher education. Expanding our knowledge of this is important to inform teacher education practice and prepare teacher students for their professional role. In this study, we included texts (understandings) and self-recorded videos (expressions) from 19 Norwegian teacher students' first practice placement during their first year of teacher education, to investigate their early understandings and expressions of classroom management. Students demonstrated awareness of emotional support and classroom organisation principles of learning interactions, while there was less evidence of students' competence in instructional support. Furthermore, there was an emphasis on aspects of learning interactions that can be planned for and controlled, rather than aspects that place high situational demands and which may require situation-specific classroom management skills. This study is a first step in establishing knowledge regarding teacher students' developing classroom management competencies, to design research-informed learning processes for teacher students in teacher education and future interventions. It is important to carefully consider the progression of teacher students' developing classroom competencies in teacher education courses, building on established skills as well as supporting progress on new ones, to support teacher students' teaching self-efficacy and classroom management competencies.

Enhancing interaction and assessment skills with intervention program in teacher training in Finland
Presenting Author: Sanni Pöysä, University of Jyväskylä, Finland; **Co-Author:**Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

This study examined teacher students' experiences of utilizing a research-based intervention program as a part of their pedagogical studies. The intervention program was created to enhance pre- and in-service teachers' awareness of dynamics of classroom interactions and increase their opportunities to provide formative assessment. The participants of the present study were 15 teacher students who participated on the intervention program during one academic year as a part of their studies. The data for the present study were collected by transcribing the group discussions that students had at the end of the academic year, and the data were analyzed with the conventional content analysis. The results showed, for example, that teacher students experienced that the tasks related to the intervention program enhanced their teacher identity. Particularly important were the discussions with respect to different themes targeted within the program. Overall, the results suggested that this intervention program can enhance teacher students' interaction and assessment skills in teacher training.

Leadership for learning – improving teaching among Swedish in-service teachers
Presenting Author: Marcus Samuelsson, Department of Behavioural science and learning, Sweden; **Co-Author:**Anja Thorsten, Department of Behavioural Sciences and Learning, Sweden

Two researchers and eight teachers participated in a collaborative research project, *Leadership for learning*, to improve in-service teachers' skills and abilities for teaching. A main aspect of the project was an intervention focusing on how teachers could plan, carry out and follow up their teaching. In relation to the intervention, an observation protocol was created consisting of three focus areas: Instructions and tasks, Task focus, and Thinking and responding. Each area was divided into two - five indicators. The researchers were responsible for the intervention and the co-researching teachers were trained to conduct the observations before and after the intervention. In all, the co-researchers observed 35 teachers when they taught, representing different school subjects. The co-researchers scored each lesson based on the degree the teachers had fulfilled each indicator in the three areas, using a four-graded scale. The pre- and post-observations were analysed in two steps. Firstly, the observed teachers were separated into three groups based on the scoring; X: 1.1-2.0, Y: 2.1-3.0 and Z: 3.1-4.0. Secondly, pre-, and post-observation were compared. Based on this, it was found that 29 of 35 teachers had changed their way of teaching in a positive direction, also that 5 of 35 had changed it in a negative direction and that 1 of 35 had not changed at all. A statistical analyse of the scores in the per- and post-observation showed that group X and Y did significant progress. The intervention seemed to have helped the teachers improve their *leadership for learning*.

Teacher stress and learning interaction quality as predictors of improvement in student engagement
Presenting Author: Sigrun K. Ertesvag, University of Stavanger, Norway; **Co-Author:**Grete Sørensen Vaaland, University of Stavanger, Norway

Adopting a person-centered approach, the present study investigates how variables of teacher stress and learning interactions co-occur within teachers. Further, how these profiles of stress and TLI predict change in students' engagement in a one-year video-based individual teacher coaching intervention. Learning interactions (TLI) are interactions between teachers and students that are central drivers for student learning and development. TLI can be organized into three domains: teachers' emotional support, classroom organization, and instructional support. The intervention is implemented in the school year 2022-2023 and aims to improve teachers' TLI skills and students' engagement in upper secondary schools.The sample consists of 99 teachers and 1400 students in 99 classrooms participating in a cluster randomized control trial designed to evaluate the effects of the intervention on, among other things, student engagement. This paper uses the baseline (spring/fall 2022) and post-test (spring 2023) student, observer, and teacher reports. Applying Latent profile analysis (LPA) four baseline profiles were identified and characterized by 1) Low level of stress – medium level of teacher-student TLI compared to the other profiles, 2) Medium stress - medium TLI 3) High Stress- low TLI quality 4) Medium stress - high TLI quality. Multilevel analyses will be applied to investigate how profiles of stress and TLI predict change in individual students' engagement (Spring 2023). Knowledge of for whom and under which conditions an intervention is effective, allows interventions to be more targeted and indicate for whom and how interventions may be particularly useful to improve teacher-student TLI and student engagement.

Session F 8

23 August 2023 14:45 - 16:15
UOM_CR
Symposium
Cognitive Science, Learning and Instructional Technology

Critical evaluation of evidence and sources when learning from multiple documents

Keywords: Attitudes and Beliefs, Cognitive Skills and Processes, Comprehension of Text and Graphics, Critical Thinking, E-learning/ Online Learning, Metacognition, Pre-service Teachers, Problem Solving, Reading
Interest group: SIG 02 - Comprehension of Text and Graphics
Chairperson: Marc Stadtler, Germany
Organiser: Marc Stadtler, Germany
Discussant: Clark Chinn, Rutgers University, United States

Learning from multiple authentic documents on the Internet has become a widespread task. Due to the open publication principle of this medium, however, individuals have to critically evaluate the validity of what they read. In so doing, individuals may make first-hand evaluations, thus critically questioning the quality of the evidence that is presented to support a claim. Second-hand evaluations, in contrast, involve that readers critically evaluate the trustworthiness of the sources at hand. A better understanding of how first- and second hand evaluations skills unfold across the lifespan and how these skills can be fostered is urgently needed. Against this backdrop, the goal of this symposium is to present four empirical studies that center on the selection, integration, and evaluation of sources and evidence including the promotion of this skill. Presentation 1 studies how learners from late primary school to young adulthood evaluate sources

and evidence in a web-based assessment tool. Using a longitudinal design, Presentation 2 examines the contribution of epistemic beliefs on pre-service teachers' selection and integration of different types of evidence. Presentation 3 studies secondary students' source evaluations as a function of strategic and metacognitive scaffolds. Finally, presentation 4 reports on the effects of a strategy training aiming at fostering secondary students' critical evaluation strategies in an out-of-school lab day. A joint discussion will be stimulated by a renowned discussant. Expected scientific and educational outcomes are a better understanding of the skills of evaluating sources and evidence and evidence-based interventions that effectively promote these skills.

Credibility Evaluation Profiles of Students Representing Primary and Secondary Education
Presenting Author: Riikka Anttonen, Tampere University, Finland, Finland; **Co-Author:**Laura Kanniainen, Tampere University, Finland; **Co-Author:**Carita Kiili, Tampere University, Finland

This study examined the structure of credibility evaluation of online texts and credibility evaluation profiles among 738 students (51% girls) from different levels of education. Students' credibility evaluations were measured in a web-based task. In this task, 140 fourth graders, 200 sixth graders, 205 eighth graders and 193 students from general and vocational upper secondary education evaluated the credibility of four online texts. Two of the online texts were more credible (a popular science text and a science newspaper article) and two less credible (a personal blog text and a commercial text). Students read one text at a time and evaluated the author's expertise, the authors' benevolence, and the quality of the evidence with a six-point scale. Based on the confirmatory factor analysis, students' credibility evaluations reflected the source texts (first-order factors) and required two latent skills (second-order factors): confirming the more credible texts and questioning the less credible texts. This factor structure was similar across the four participating grade levels. The latent profile analysis identified four credibility evaluation profiles: (1) critical evaluators (n = 144), (2) emerging evaluators (n = 204), (3) hesitant evaluators (n = 271), and (4) trusting evaluators (n = 119). Findings showed that the number of critical evaluators increased among older students: 8% of fourth graders, 22% of sixth graders, 32% of eighth graders and 38% of students from general and vocational upper secondary education were critical evaluators. This indicates that there is still room for improvement across all grade levels.

How do pre-service teachers use multiple documents depending on their epistemic perspectives?
Presenting Author: Martin Greisel, University of Augsburg, Germany; **Co-Author:**Ingo Kollar, University of Augsburg, Germany

Teachers need to process multiple documents containing different kinds of knowledge (i.e., experiential knowledge, scientific knowledge, and local contextual knowledge) to solve teaching problems they are confronted with. How they integrate these types of knowledge is assumed to depend on their epistemic perspective. Therefore, we examined the extent to which their epistemic perspective (absolutist, multiplistic, evaluativist) predicts how they use documents with different types of knowledge (experiential knowledge: Whatsapp chat and internet forum; scientific knowledge: journal article and handbook chapter; contextual knowledge: expert report on one student and teachers' report about the class) when they solve a pedagogical problem. This was presented as a video vignette of collaborative learning. Our results showed that an absolutist perspective did not predict how frequently a document was used (all $\beta \leq |.10|$, $p \geq .09$). However, a multiplistic perspective was detrimental to the use of scientific documents (journal article: $\beta = -.14$, $p = .021$; handbook chapter: $\beta = -.22$, p

Scaffolding Students' Source Trustworthiness Evaluation
Presenting Author: Danna Tal Savir, University of Haifa, Israel; **Co-Author:**Sarit Barzilai, University of Haifa, Israel; **Co-Author:**Fayez Abed, University of Haifa, Faculty of Education, Israel; **Co-Author:**Shiri Mor-Hagani, University of Haifa, Faculty of Education, Israel

In a "post-truth" era, students require more than ever the capabilities of evaluating source trustworthiness in order to decide whether to believe the information that they read online. Therefore, there is a need to develop instructional approaches for promoting source evaluation. The aim of our study was to advance the understanding of how epistemic scaffolds contribute to the development of students' source evaluation performance. In a quasi-experimental study with 137 9th grade students, we examined the contribution of learning with a strategic epistemic scaffold, which included a digital tool for mapping sources, claims, and evidence from multiple documents, and a meta-epistemic scaffold, which involved collaborative development of class lists of evaluation criteria, to students' capabilities to use source evaluation to select documents and to draw conclusions. Students who learned with the document mapping scaffold increasingly used sourcing criteria to justify their document evaluations and became more likely to consider source trustworthiness as they weighed claims and drew conclusions. The meta-epistemic criteria discussions enhanced the effects of document mapping by leading to greater metacognitive knowledge about source trustworthiness evaluation criteria and to greater vigilance against unreliable sources. The scaffolds had no significant impact on the amount of documents that students' used in their essays. These results demonstrate that learning with a strategic document mapping scaffold can foster source trustworthiness evaluation even without explicit meta-epistemic discussions of evaluation criteria. However, supplementing mapping with meta-epistemic criteria discussions can lead to greater metacognitive growth and thus support more robust source evaluation.

Can 5G radiation kill birds? Promoting the use of evaluation strategies against misinformation
Presenting Author: Philipp Marten, Ruhr University Bochum, Germany; **Co-Author:**Sandra Aßmann, Ruhr-University Bochum, Institute of Educational Sciences, Germany; **Co-Author:**Marc Stadtler, Ruhr-University Bochum, Institute of Educational Science, Germany

When learning online, a wide variety of content is easily available. Yet, Internet users must evaluate the veracity of what they read, a task that adolescents often neglect. Therefore, the aim of the present study was to test the effectiveness of a newly developed strategy training aiming at the promotion of two evaluation strategies, sourcing and corroboration, using authentic Internet materials. The training was compared to a control group that received a declarative knowledge training on the topic of misinformation of about the same length. Data were collected from 196 7^{th} and 8^{th} graders who participated with their classes in an out-of-school science lab day. Classes were assigned randomly to either the strategy training or the knowledge training. Data were collected at three points of measurement (before, immediately after, and three-four weeks after the training). Analyses controlled for individual difference variables reading proficiency, self-reported prior knowledge, topic interest, and socioeconomic background. As expected, the strategy training group outperformed controls in terms of discriminating between sources of higher and lower trustworthiness, debunking false statements, and knowledge of evaluation strategies in the short and medium term. Instructors may readily implement the theoretically founded and empirically validated training materials that are published as Open Educational Resources. Future research, however, should examine ways of increasing the magnitude of effect sizes, which were only small to moderate in the present study. This could even enhance the potential of this training approach in terms of equipping adolescents with the skills necessary in the information age.

Session F 9

23 August 2023 14:45 - 16:15
UOM_A03
Single Paper
Assessment and Evaluation, Instructional Design, Teaching and Teacher Education

Curriculum Development for Science Education

Keywords: Competencies, Curriculum Development, Feedback, Informal Learning, Problem Solving, Science and STEM, Science Education, Secondary Education
Interest group: SIG 01 - Assessment and Evaluation, SIG 02 - Comprehension of Text and Graphics, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Merle-Sophie Thielmann, University of Mannheim, Germany

STEM learning experiences as boundary objects? The Hong Kong case
Keywords: Curriculum Development, Science and STEM, Science Education, Secondary Education
Presenting Author: Ka Lok Cheng, The University of Hong Kong, Hong Kong

STEM curriculums should function as boundary objects that bridge different disciplinary perspectives. However, there is currently insufficient invested effort regarding how boundary-crossing could be realised in the curriculum artefacts. Thus, this work serves to supplement the related dialogues in interdisciplinary

STEM education. Specifically, the current study aims to understand whether dialogues between perspectives were supported by the STEM-related elements in the official junior science curriculum documents and the textbooks accordingly written in Hong Kong. Content analysis was carried out under the guidance of analytical constructs that pay attention to the identification, coordination, reflection, and transformation of perspectives. The study shows that the curriculum artefacts could support the identification and coordination of different disciplinary perspectives to a certain extent, like the description of the nature of the subject and the inclusion of learning activities that might serve as boundary objects. Nevertheless, there are insufficient opportunities for the students to reflect on their own perspectives and develop mechanisms for working and functioning at the boundaries. This study could serve as a stimulus for further academic dialogues and guidance for revising official curriculums and textbooks to allow students to be better equipped to deploy interdisciplinary strategies to resolve problems in uncertain times.

Towards Defining, Assessing and Modelling Competency Levels in the Field of Stoichiometry
Keywords: Competencies, Feedback, Problem Solving, Science Education
Presenting Author: Krause Alexander, Gottfried Wilhelm Leibniz Universität Hannover, Germany; **Co-Author:**Andreas Nehring, Gottfried Wilhelm Leibniz Universität Hannover, Germany

Stoichiometry is a particular difficulty in learning chemistry for learners worldwide. Various studies have already been conducted on the difficulties and their causes, the necessary prerequisites as well as possible learning supports in stoichiometry. Competency-based approaches that allow to determine learners' level of competency based on assessment are still rare in this field. We developed a competency model in the field of stoichiometry describing four competency levels (“StoiCoLe-model”). Learners have high stoichiometric competencies if basic knowledge, stoichiometric equations and reaction equations can be interconnected and applied to solve complex stoichiometric problems. We developed a test consisting of 40 items that assesses the defined competencies and administered it in a sample of 79 mainly first-year students from various chemistry courses. Our results indicate adequate psychometric properties and provide confirming evidence for three of four levels. We discuss these findings with regard to possible alternative competency levels and to fostering learning and teaching in stoichiometry.

Designing Social Justice Oriented Science Curricula Towards Consequential Learning
Keywords: Curriculum Development, Science and STEM, Science Education, Secondary Education
Presenting Author: Ravit Duncan, Rutgers University, United States; **Co-Author:**Edna Tan, UNC Greensboro, United States; **Co-Author:**Rishi Krishnamoorthy, PSU, United States; **Co-Author:**Tasha Austin, Buffalo State College, United States; **Co-Author:**Frieda Reischman, Concord, United States; **Co-Author:**Sugat Dabholkar, GSE-Rutgers University, United States; **Co-Author:**Ti'Era D. Worsley, University of South Carolina-Greensboro, United States; **Co-Author:**Megumi Asada, Rutgers University, United States

Supporting minoritized students' participation in a science classroom requires designing with expansive notions of what counts as doing and learning science. Additionally, prior work on equitable participation in STEM learning contexts has demonstrated that disrupting settled, and powered participation structures can support expansive epistemic agency. Building on this work, we designed a middle-school biology unit about stress to address the topic of body systems and their interactions, while also challenging the boundaries of disciplined science, and promoting social change making through consequential learning. We identified three core axiological commitments that shaped the design of the unit - a) challenging and expanding disciplined science by entangling body and environment, b) politicizing “environment” and relating injustices across local and national contexts, and c) supporting social change making at the structural level through allied political struggle. We present how these commitments were operationalized in the unit design and how that supported marginalized students' consequential learning in a science classroom. Our work contributes to understanding ways to design for justice-oriented learning in a science classroom.

Space for All: A Multinational Survey of Astronomy Education
Keywords: Curriculum Development, Informal Learning, Science and STEM, Science Education
Presenting Author: Christine Hirst Bernhardt, University of Maryland, College Park, United States; **Co-Author:**Janelle M. Bailey, Temple University, United States

Astronomy is one of the oldest sciences in human history; space sciences seek to answer the biggest questions, and encompass technologies that directly impact humanity. Space content can naturally integrate into existing subjects and leverage students' innate curiosities and interests, which is critical now as we adapt learning for digital natives. Astronomy can be a “gateway” to inspire further STEM learning. In 2021, a study of 53 nations found astronomy present in 100% of national curricula, and made recommendations for professional development and further research (Salimpour et al., 2021). The present study provides qualitative context for those recommendations and establishes a foundation on which to ground further work with educators. Surveys were collected from participants in 21 countries other than the USA based on their involvement with astronomy education efforts, and 6 were selected to participate in semi-structured interviews. Initial results favor informal astronomy learning over mandated content. Partnerships with universities and community-based efforts such as telescope loan programs provide promising opportunities as the primary roles of astronomy education in these countries. Results also highlight the national influence of space programs and involvement with the global space economy as well as restrictive curricula upon access to astronomy education. Participants from every represented nation expressed frustration at the lack of professional development for teachers. Future studies should focus on the impact of formal and informal collaborations, and provide quality materials for teachers to integrate astronomy into their courses.

Session F 10

23 August 2023 14:45 - 16:15
AUTH_T102
Single Paper
Learning and Social Interaction

Anxiety, Stress and Resilience in Students

Keywords: Achievement, Anxiety and Stress, At-risk Students, Peer Interaction, Resilience, Self-determination, Social Aspects of Learning and Teaching
Interest group: SIG 10 - Social Interaction in Learning and Instruction
Chairperson: Tina Hascher, Switzerland

Resilience trajectories despite IPV experiences and the influence of protective factors
Keywords: Anxiety and Stress, At-risk Students, Resilience, Self-determination
Presenting Author: Dilan Aksoy, University of Applied Sciences and Arts Northwestern Switzerland PH (FHNW), Switzerland; **Co-Author:**Céline Favre, PH FHNW, Institut Forschung und Entwicklung, IFE, Switzerland; **Co-Author:**Celeste Simões, University of Lisbon, Faculty of Human Kinetics, Portugal; **Co-Author:**Petra Sidler, School of Education, FHNW, Switzerland

Countless studies have shown that parental violence can severely impair children's development. Meta-analyses show a strong association between parental violence and psychopathological consequences as well as impaired socio-emotional development. Interparental violence (IPV) is the most commonly observed form of violence in adolescence and is associated with psychopathological consequences, future violent behavior, and delinquency. Despite these serious consequences and the high prevalence (35-49%) of IPV experiences in the USA and Europe, there are few analyses that focus on person-centered models and consider psychological IPV. Therefore, this study examines the following question: What are the resilience trajectories of youth with IPV experiences, how stable are they, and what protective factors that can be addressed in school and sociodemographic variables predict group membership? Using a sample of 879 (T1; August 2020) and 770 (T2; July 2021) adolescent Swiss students aged 11.74 (*SD*= .64) and 13.77 (*SD*= .53), respectively, we conducted a Latent Transition Analysis and analyzed profile affiliation using multinomial logistic regression analysis. Results show that there are four time-invariant IPV-resilience trajectories, with the non-resilience profiles being the most stable profiles over time. Socio-demographic variables and parental physical violence as well as protective factors showed significant prediction of profile membership.

Resilience in adolescence over time: A Three-Wave Latent Transition Analysis on Violence-Resilience
Keywords: Anxiety and Stress, At-risk Students, Resilience, Self-determination
Presenting Author: Wassilis Kassis, School of Education, FHNW, Switzerland; **Co-Author:**Céline Anne Favre, School of Education, FHNW, Switzerland; **Co-Author:**Dilan Aksoy, School of Education, FHNW, Switzerland

Internationally, about 25% of all children experience physical abuse by their parents. Despite the numerous odds, there are adolescents who have experienced even the most serious forms of physical abuse by their parents escape the vicious family violence cycle. In this study, we analyzed longitudinally over two years and three waves the data from a sample of $N = 1767$ seventh-grade high school students in Switzerland on physical abuse by their parents, by conducting an online questionnaire. We found that in our sample, about 20% of the participating adolescents' parents had physically abused them. We considered violence resilience a multi-systemic construct that included the absence of psychopathology on one hand and both forms of well-being (psychological and subjective) on the other. Our latent construct included both feeling good (hedonic indicators, such as high levels of self-esteem and low levels of depression/anxiety and dissociation) and doing well (eudaimonic indicators, such as high levels of self-determination and self-efficacy as well as low levels of aggression toward peers). By applying a person-oriented analytical approach via latent transition analysis with a sub-sample of students who experienced physical abuse ($n_{W3} = 523$), we identified and compared longitudinally over three waves four distinct violence-resilience patterns and their respective trajectories over time. By applying to the field of resilience, one of the most compelling insights of well-being research (Deci & Ryan, 2001), we identified violence resilience as a complex, multidimensional latent construct that concerns hedonic and eudaimonic well-being and is not solely based on terms of psychopathology

Socio-emotional violence resilience – a two wave latent transition analysis
Keywords: Anxiety and Stress, At-risk Students, Peer Interaction, Resilience
Presenting Author:Céline Favre, PH FHNW, Institut Forschung und Entwicklung, IFE, Switzerland; **Co-Author:**Dilan Aksoy, University of Applied Sciences and Arts Northwestern Switzerland PH (FHNW), Switzerland; **Co-Author:**Wassilis Kassis, School of Education, FHNW, Switzerland

Adolescent's exposure to intimate partner violence (IPV), which is increasingly recognized as a distinct form of childhood maltreatment, is associated with a range of negative psychosocial outcomes, including increased risk for psychopathological behaviors and posttraumatic stress symptoms. Violence-resilient adolescents are those that act and grow in a social and emotional way that is adaptive despite IPV. The school class context as part of the social system gains importance especially in adolescence as a place of socio-emotional development and in the context of IPV as an alternative to the dysfunctional home. Therefore, this study considers a person-centered approach that focus on the social system in school context. Based on a sample in autumn 2020 of 933 (t1) and a sample in spring 2021 of 776 (t2) secondary school students in Northwestern Switzerland (7th and 8th grade) with IPV experiences, a latent transition analysis with two waves is conducted in the present study to uncover socio-emotional resilience classes and the respective latent transitions over two time points. We identified four different patterns of socio-emotional violence resilience for both measurement time points and compared them longitudinally with their respective trajectories. The non-resilient pattern appeared to be the most stable pattern. Using multinomial logistic regression analysis, gender, migration background, peer rejection, prosocial behavior of school class and dissociation emerged as significant predictors of pattern membership.

Mediation of interpersonal relationships in school stress and student academic achievement.
Keywords: Achievement, Anxiety and Stress, Peer Interaction, Social Aspects of Learning and Teaching
Presenting Author: Olga Cuadros Jiménez, Universidad Católica Silva Henríquez, Chile; **Co-Author:**Benito León del Barco, Universidad de Extremadura, Spain

Stress in the educational context exerts significant pressure on individuals, affecting the competencies to face the challenges in different aspects. The consequences of stress on different dimensions of student's life are especially evident in the impairment of interpersonal relationships which would explain problems of maladjustment and social adaptation (Davies, Janus, Duku, & Gaskin, 2016). The diminish of quality of interpersonal relationships that students have with others in their educational environment is significant, since these bonds are promoters for psychological and social well-being that affect the academic achievement. This study proposed a mediation model, to test the effect of school stress on academic achievement, mediated by positive interpersonal relationships with peers and teachers. The sample consisted of 1273 students; with mean age= 14.20 years (SD= 2.43); 47.5% (n=605) females, 48% (n=611) males and 4.5% (n=57) non-binary.The results show a statistical significant effect in mediation models. The indirect effect that best statistically quantifies the effect of scholar stress on academic achievement is the one corresponding to the mediating of Positive Interpersonal Relationships with Teachers (β=0.022). Results highlight the relevance of the interpersonal dimension in the processes of learning and academic performance. It also provides clues about the protective factor of positive interactions with significant others in the learning context, highlighting the socio-affective role of the teacher in particular. Data quality considers a good fit, reliability and validity indicators. All research procedures were approved by the ethics committee of the sponsoring university.

Session F 11

23 August 2023 14:45 - 16:15
AUTH_DC3
Single Paper
Learning and Instructional Technology, Learning and Social Interaction

Play in Early Childhood Education

Keywords: Cognitive Skills and Processes, Critical Thinking, Dialogic Pedagogy, Digital Literacy and Learning, Early Childhood Education, In-service Teachers, Learning Approaches, Multimedia Learning, Problem Solving, Science and STEM, Social Interaction
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 28 - Play, Learning and Development
Chairperson: Athena Daniilidou, Greece

Analysis of Teacher-Child Interactions in Tablet-Supported Episodes During Constructive Play
Keywords: Early Childhood Education, Learning Approaches, Multimedia Learning, Science and STEM
Presenting Author: Jossen Priska, University of Teacher Education Lucerne (PH Luzern), Switzerland; **Co-Author:**Ueli Thomas Studhalter, University of Teacher Education Lucerne (PH Luzern), Switzerland; **Co-Author:**Marco Seeli, University of Teacher Education Lucerne (PH Luzern), Switzerland; **Co-Author:**Annette Tettenborn, University of Teacher Education of Lucerne, Switzerland

The use of tablet computers in early childhood education has steadily increased in recent years. The question is no longer whether or not to use digital devices, but how to use them wisely. In this study, we investigate the use of tablets in a scenario of constructive play in kindergarten classes. The participating teachers use tablets to add visual feedback to their conversations with children about the stability of their block constructions. Theoretically, we locate the quality of teacher-child interactions in the concept of *sustained-shared thinking* and in the importance of attention and motivation for young children's learning. Based on these theories, we ask (Q1) to what extent a number of quality indicators of teacher-child interactions are reflected in tablet-supported episodes and (Q2) which tablet-specific patterns can be identified. Based on 8.7 hours of video material, we evaluate ten selected teacher-child interactions by conducting a qualitative content analysis with MAXQDA. The results indicate that the teachers show a rich scaffolding behavior and frequently use content-specific language when discussing the tablet videos with the children. A higher level of verbal involvement on the part of the children could not be determined. Further, we identify four patterns associated with the use of the tablet in the classroom: (1) delay in the course of action, (2) magnet-effect of the video, (3) revisiting of an observation and/or emotion, and (4) fascination with the medium. We discuss these findings against the background of integrating digital media in early childhood education.

Exploring Polyadic Sustained Shared Thinking-Interactions during Free Play, Meal and Tidying Up
Keywords: Cognitive Skills and Processes, Dialogic Pedagogy, Problem Solving, Social Interaction
Presenting Author: Alexandra Waibel, University of Teacher Education, St. Gallen, Switzerland, Switzerland

In the discourse on quality in early childhood education, educator-child interaction is considered to influence children's developmental progress (Wirts et al.

2017). Sustained Shared Thinking (SST) was identified as an important factor of successful interaction in early childhood institutions (Siraj-Blatchford et al. 2002). However, SST-interactions are rarely observable in kindergarten practice and usually identified and analysed in dyadic sequences. As communication in kindergarten also takes place in group settings the present study focuses on polyadic SST-interactions. Using an explorative qualitative research design, micro-process were analysed in order to identify strategies of kindergarten teachers that facilitate SST in groups of children during free play, meal or everyday sequences. The data include videography and information on children's family language from the international “SpriKiDS” study (Vogt et al. 2019). The analysis was conducted through Linguistic Conversation Analysis (Brinker & Sager 2010) and Grounded Theory (Strauss & Corbin 1996) supplemented by visualisations (Waibel 2021). Ten SST-sequences were explored in different group sizes involving ten kindergarten teachers and 43 monolingual and multilingual children. The results indicate that kindergarten teachers show an explorative and process-oriented approach and use combinations of several strategies to facilitate SST in groups. No differences can be observed in the applied combinations of strategies in multilingual and monolingual groups. Sensitive responsiveness to the interests and imagination of children and questions seem to facilitate SST as well as referring to children‘s life and switching between practical actions and cognitive reflections. The findings will be discussed regarding possible implications for pedagogical practice.

The technological landscapes with IoToys early childhood education in Norway
Keywords: Critical Thinking, Digital Literacy and Learning, Early Childhood Education, In-service Teachers
Presenting Author: Maria Dardanou, University of Tromsoe, Norway

According to the Norwegian Framework for Kindergartens (Norwegian Directorate for Education and Training, 2017), kindergarten teachers should use digital technology as a method in their everyday activities and practices. Norwegian ECE focuses on play, and especially free play activities that promote children participation and the holistic development of the child. The chapter discusses how Norwegian ECE discourses related to play may affect teachers’ views and attitudes and how children’s own participation in play activities with IoToys are a means for implementing IoToys. In this qualitative study, forms of play and learning with IoToys are investigating as spaces that open for creative and experimenting activities (Bølgan, 2017). As digital judgement is an aspect of kindergarten’s digital practices, play activities with IoToys provide opportunities for practising ethical reflections around use of these toys (Dardanou & Kofoed, 2019). Children’s reflections during play activities with IoToys relates to an introduction to the ideas and values of digital judgement and ethical considerations. Implementation of kindergarten practices shape conditions for human experience, identity and meaning making, providing a variety of avenues to understand how people are shaped and shape themselves. It will be discussed in what ways use of IoToys in ECE can introduce conditions for children’s cultural formation in kindergarten’s educational practices.

Session F 12

23 August 2023 14:45 - 16:15
UOM_R09
Single Paper
Educational Policy and Systems, Motivational, Social and Affective Processes

Educational Tracking, School Transitions and School Dropout: Social Processes

Keywords: Achievement, Attitudes and Beliefs, Peer Interaction, Qualitative Methods, Quantitative Methods, Secondary Education, Social Aspects of Learning and Teaching, Social Interaction
Interest group: SIG 08 - Motivation and Emotion, SIG 10 - Social Interaction in Learning and Instruction
Chairperson: Andreas Gegenfurtner, University of Augsburg, Germany

Stereotypes on Educational Tracks Among Secondary School Students in Flanders (Belgium)
Keywords: Attitudes and Beliefs, Peer Interaction, Quantitative Methods, Secondary Education
Presenting Author: Margo Vandenbroeck, KU LEUVEN (BE 0419.052.173), Belgium; **Co-Author:**Jonas Dockx, KU LEUVEN, Belgium; **Co-Author:**Rianne Janssen, KU LEUVEN, Belgium

According to the Stereotype Content Model (SCM), members of other groups are perceived according to the dimensions of competence and warmth. The model has been successfully applied to the perception of groups such as gender groups, ethnic groups and national groups. The present study’s aim was to empirically investigate stereotypes on educational tracks held by Grade 12 students belonging to three different tracks (general track, technical track, vocational track) in Flanders (the northern part of Belgium). Participants had to rate students in different educational tracks related to 12 personality traits, which were based on existing warmth- and competence questionnaires. Exploratory and confirmatory factor analyses were conducted to examine the structure of stereotypes, ANOVA was used to investigate mean differences. Analyses showed that the SCM could not be fitted for stereotypes on educational tracks. Exploratory factor analysis resulted in two factors: a positive valence factor and a negative valence factor. Results further indicated that students from different educational tracks were perceived significantly different with regard to several personality traits. Additionally, evidence was found for ingroup favoritism, meaning that students rated their own educational track more positively compared to other educational tracks. By identifying stereotypes on educational tracks, this study contributes to the literature on stereotypes and to an increased awareness of their existence and consequences.

Delayed tracking and the social meanings of educational tracks: an ethnographic study
Keywords: Peer Interaction, Qualitative Methods, Secondary Education, Social Aspects of Learning and Teaching
Presenting Author: Pomme van de Weerd, Utrecht University, Netherlands

Delayed tracking, i.e. postponing the separation of students into levels of education, is currently being proposed by educational bodies in the Netherlands to address two problems resulting from early tracking: inequality of educational opportunities and social segregation. There is a long-standing international tradition of research on the effects of (delayed) tracking on inequality. However, much less is known about social aspects of delayed tracking. This paper reports on ethnographic research at a delayed tracking school in the Netherlands. It analyzes discourse of students, teachers, and the school board, around tracking and detracking, and addresses the contradictions that arise when, at a local (school) level, explicit efforts are made to blur borders between tracks and present them as equally valuable, while at a societal level, they are usually kept separate and are perceived as hierarchically ordered. Furthermore, I address how issues around ethnic and social background arise and get entangled with tracking discourse. The paper contributes to academic knowledge about the social aspects of tracking and detracking, and has practical applicability for policy discussions around tracking in the Netherlands and internationally.

Social support stability in school transitions: Associations with truancy and completing education
Keywords: Achievement, Peer Interaction, Quantitative Methods, Social Interaction
Presenting Author: Tuomo Virtanen, University of Jyväskylä, Finland; **Co-Author:**Kati Vasalampi, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland; **Co-Author:**Jenni Pelkonen, University of Jyväskylä, Finland; **Co-Author:**Anna-Maija Poikkeus, University of Jyväskylä, Finland

Dropping out of school during upper secondary education may lead to problems in the transition to adulthood and integration into society as well as to low well-being. A precursor to school dropout is truancy, that is skipping classes or school without a valid excuse. Prior evidence shows that social support in the relations between students and adults serves as a protective factor hampering students from school absenteeism and dropout. The aim of this study was three-fold. First, we investigated the extend student-perceived social support from family, peers, and teachers is stable (trait-like) across three educational contexts (primary school, lower secondary school, and upper secondary education) versus grade-specific (state-like, RQ1). Second, we used perceived support trait variance to predict whether students play truant from upper secondary education and do not complete the education in normative time (maximum 3.5 years, RQ2). Third, we tested whether truancy at the first year of upper secondary education mediated the associations between the three sources of support and non-completion of upper secondary education in normative time (RQ3). The STMS models showed, first, that 46%, 38%, and 31%, of the variances of student-perceived support from family, peers, and teachers respectively were trait-like. Therefore, 54%, 62%, and 69% of the variance were state-like, respectively.

Second, the results indicated that support from family and peers decreased upper secondary students' likelihood of truancy and of not completing upper secondary education. Third, teacher support predicted a lower likelihood of truancy but not completion of upper secondary education in normative time.

School dropout: Investigating pathways of academic achievement and psychosocial learning environment
Keywords: Achievement, Peer Interaction, Secondary Education, Social Aspects of Learning and Teaching
Presenting Author: Maren Tvedt, University of Stavanger, Norway; **Co-Author:**Edvin Bru, University of Stavanger, Norway

As one of very few, this study combined upper secondary school students' (n = 1241) self-reports on how they perceive the psychosocial learning environment in school with register data on academic achievement, to investigate dropout from upper secondary education. The study was conducted in the Norwegian upper secondary education context, where "dropout" is typically defined as non-obtained graduation within five years after starting upper secondary education. The aim was to investigate whether aspects of the psychosocial learning environment (i.e., perceived emotional support from teachers, and loneliness among peers at school) have unique predictive roles on school dropout, either directly or indirectly via subsequent academic achievement. Results indicated that perceived emotional support from teachers during first year of upper secondary school had a negative indirect effect on school dropout – via increased academic achievement. On the other hand, loneliness among peers at school did not affect subsequent academic achievement but yielded a positive, direct effect on school dropout.

Session F 13

23 August 2023 14:45 - 16:15
UOM_A13
Single Paper
Cognitive Science, Higher Education, Lifelong Learning, Teaching and Teacher Education

Environmental Education and Climate Change

Keywords: Attitudes and Beliefs, Developmental Processes, Digital Literacy and Learning, Emotion and Affect, Environmental Education, Example-based Learning, Misconceptions, Primary Education, Qualitative Methods, Social Media, Sustainable Development, Teaching Approaches
Interest group: SIG 03 - Conceptual Change, SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education, SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Mari Nygård, NTNU, Norway

Friluftsliv in Teacher Education – a step towards Environmental Awareness
Keywords: Environmental Education, Example-based Learning, Sustainable Development, Teaching Approaches
Presenting Author: Helga Aadland, Western Norway University of Applied Sciences, Faculty of Education, Arts and Sports, Norway; **Co-Author:**Joergen Nerland, Western Norway University of Applied Sciences, Norway; **Co-Author:**Trond Egil Arnesen, Western Norway University of Applied Sciences, Norway

While outdoor education may traditionally be linked to aspects such as personal development and outdoor skills, environmental issues now prompt a consideration of how outdoor education can contribute to pro-environmental changes. In our research we explore the environmental education potential of friluftsliv as a Nordic outdoor education tradition. Special attention is directed toward friluftsliv's environmental dimension and the possible potential such a quality could have in the development of environmental awareness. An extended version (Nerland & Nygård, 2019) of the environmental staircase model (Langholm et al., 2011; Staberg et al., 2020) is presented and applied as a basis for analyses of empirical data consisting of statements from international Erasmus students participating in the pedagogical friluftsliv course "Fjords and Glaciers". To analyze our data, we used systematic text condensation (Malterud, 2012). Interpretation of the statements reveal that students experience a positive change in their values and attitudes towards nature, albeit differences in environmental awareness development are apparent. Independent of their level of environmental awareness, all the teacher education students express that the course had an influence on their future professional practice.

Climate change discourses on social media: Clarifying the potential of relevant literacies
Keywords: Attitudes and Beliefs, Digital Literacy and Learning, Environmental Education, Social Media
Presenting Author: Catharina Philine Pfeiffer, Leibniz University Hanover, Germany; **Co-Author:**Stefanie Dr. Lenzer, Leibniz University of Hannover, Institute for Science Education, Germany; **Co-Author:**Andreas Nehring, Gottfried Wilhelm Leibniz Universität Hannover, Germany

From the perspective of science education, *literacies* describe a promising construct for effective climate education in the digital era. They are supposed to define the factual knowledge, relevant competencies, as well as specific attitudes and behaviours students have to develop in order to a) take climate-friendly action or b) evaluate controversial online information about anthropogenic climate change. In international educational research, many *literacies* were already defined that are focussing either on the development of pro-environmental behaviour like climate action, or on the evaluation of online information. Besides that, it remains unclear which *literacies* are indeed relevant in the context of climate change discourses on social media and which critical components they contain. Based on a systematic literature review according to the PRISMA statement, this contribution will first of all address the research question, which relevant *literacies* in the context of climate change discourses on social media can be found in the literature. Through a qualitative content analysis with the definitions of these *literacies* the specific components they contain will be presented. Finally, the *literacies'* potential for students' competent information gain from social media will be clarified. Thereby, the authors will mainly contribute to the state-of-the-art in international science education literature. Furthermore, the authors will be able to provide implications for future climate education and educational research in the digital era.

Elementary students' understanding and changing discourse about climate change
Keywords: Environmental Education, Misconceptions, Primary Education, Qualitative Methods
Presenting Author: Gertraud Benke, Klagenfurt University, Austria

Action to combat climate change is one of the UN's 17 Sustainable Development Goals. A basic understanding of climate change is vital for people to support political action. In the school context, curricula have been developed for middle and high school students; students' understanding of climate change has been investigated mostly concerning pre-service teachers and to a lesser degree for middle and high-school students' ideas. Almost no study analyses elementary students' understanding of climate and climate change. Using conceptual change research as a framework, the present paper analyzes 31 3rd-grade students' understanding of climate and climate change. Students were interviewed in a period of 2-3 months before and after instruction about climate change. We asked students about their ideas on climate change, the greenhouse effect, climate, and weather. The interviews were transcribed and coded, and concept maps were drawn for each interview by the researcher. The analysis looks at the breadth of existing concepts concerning climate and climate change and the difference of students' answers in the two interviews. The analysis of the pre-interviews found four different understandings of the relation between weather and climate, a lack of relation between the notions of climate and climate change, a negative valuation of climate change, and a lack of understanding that climate change affects humans. For the presentation, these findings will be compared with the findings of the post-interviews, and the stability or systematicity of change between the answers in the two interviews will be addressed.

Teaching psychology with science-fiction at the Bachelor level
Keywords: Developmental Processes, Emotion and Affect, Environmental Education, Qualitative Methods
Presenting Author: Laure KLOETZER, Institute of Psychology & Education, University of Neuchâtel, Switzerland

For the past five years, we have been teaching environmental psychology at Bachelor's level, with an original approach using science-fiction writing and more precisely the *protokools* invented by the Zanzibar group of science-fiction writers (www.zanzibar.zone). This paper will examine this attempt from two complementary angles: on the one hand, from a pedagogical point of view: how can science-fiction help students think about their own relationship with nature? On the other hand, from a scientific point of view: what do we learn through the dreamed or distressing worlds constructed by our students? We analyze a corpus of 100 stories and use Vygotskij' concept of the cycle of imagination as a way to understand what happens in this exercise.

Session F 14

23 August 2023 14:45 - 16:15
UOM_A08
Single Paper
Cognitive Science, Learning and Social Interaction, Motivational, Social and Affective Processes, Teaching and Teacher Education

Promoting Children's Self-Regulation: Individual, Parental and Teacher factors

Keywords: Cognitive Development, Early Childhood Education, Emotion and Affect, Informal Learning, Learning Strategies, Mathematics/Numeracy, Metacognition, Multicultural Education, Parental Involvement in Learning, Primary Education, Problem Solving, Self-regulated Learning and Behaviour
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 08 - Motivation and Emotion, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Daniel Muijs, Queen's University Belfast, United Kingdom

Maternal contingency and their relation to preschoolers' problem-solving and strategic behaviors
Keywords: Informal Learning, Parental Involvement in Learning, Problem Solving, Self-regulated Learning and Behaviour
Presenting Author: Maren Stern, Heidelberg University, Germany; **Presenting Author:**Leonie Köllbichler, University of Heidelberg, Germany; **Co-Author:**Silke Hertel, Ruprecht-Karls-Universität Heidelberg, Germany

Parental contingency is characterized by adjusting the support to children's developmental level. This gradual support has been shown to enhance children's self-regulatory development. However, in preschool age, micro-analytical approaches are lacking that measure this dynamic process in more detail. Therefore, the current study aimed to develop a new coding scheme measuring different levels of maternal contingency during mother-child interaction and examine how these levels are related to joint task performance, child-alone task performance, and children's strategic self-regulatory behaviors. *N*=34 mothers and their preschool-aged child worked collaboratively on several problem-solving tasks. Afterwards, the child solved the same tasks independently. Four levels of maternal contingency were observed: 1) contingent (dynamically adapted support), 2) non-contingent-up (more support than needed), 3) non-contingent-down (less support than needed), and 4) non-contingent non-gradual support (support increases too quickly). Mothers provided contingent support during most of the problem-solving tasks. The different levels of contingency were significantly related to mother-child task performance, child-alone task performance, and children's strategic self-regulatory behaviors.

The Role of Kindergartners Private Practice in Self-Regulation and Phonological Awareness in English
Keywords: Early Childhood Education, Learning Strategies, Multicultural Education, Self-regulated Learning and Behaviour
Presenting Author: Ana Paula S. Loures-Elias, Interdependent Researcher, Portugal; **Co-Author:**Marilia Mendes Ferreira, University of Sao Paulo, Brazil

This study investigates how kindergarten children's private practice fostered their self-regulation and phonological awareness in early reading and writing in English as a second language (L2). Private speech emerges as a mediational and a psychological sign for thinking and self-regulation in which children use their private speech to guide them to focus attention, control their affective states, pace their motor activity, self-motivate, and self-praise. In the case of second language (L2) learners, the self-regulatory function of private speech has been extended to private practice during their learning process (Saville-Troike, 1988) in English as an L2 so children could be outside of social conversations with others, return back in time and place themselves in other contexts in their minds, and privately practice what they wanted or needed to. In this way, private speech in the private practice of children's learning process is considered a self-regulatory (Saville-Troike, 1988) and phonological awareness tool. The findings from this study advances empirical research grounded in the notion of language, conceptualized by Vygotsky, and help teachers to better understand their students' phonological awareness even when they are not the interlocutors of the teacher.

Regulating Emotions to Improve the Quality of Teaching and Learning in the Early Years
Keywords: Cognitive Development, Early Childhood Education, Emotion and Affect, Self-regulated Learning and Behaviour
Presenting Author: Erika Galea, University College London, Institute of Education, Malta

Emotion regulation (ER) is considered a crucial developmental milestone necessary over the lifespan, especially during early childhood. The principal objective of the study was to trial and test the effectiveness of an intervention to support the promotion of ER strategies based on Gross' model of ER (2015) by teachers within early years settings, which would foster better effective learning leading to improved academic performance and eventually safeguard against mental/adjustment problems later on in life. The use of learning strategies (the antecedent-focused strategies: situation modification, distraction, cognitive reappraisal) alongside ER can support self-regulation of both positive and negative emotional episodes and equip pupils with effective strategies in order to cope with the pressures of everyday life. Effectiveness of the intervention programme was assessed in terms of evidence of ER and quality of classroom environment relative to a control sample through video-recorded systematic classroom observations and semi-structured interviews at implementation stage. When comparing the results of the Intervention Group to the Control Group, the former adopted the antecedent-focused ER strategies with their pupils at implementation stage following the teacher training workshop whilst the latter did not, as they chose to engage using the response-focused ER strategy (suppression). At implementation stage, cognitive scaffolding of the ER strategies through co-regulation was apparent for the Intervention Group, which led to peer and/or self-regulation, with a favourable impact on the students' behaviour and learning environment. Gross, J. J. (2015). The Extended Process Model of Emotion Regulation: Elaborations, Applications and Future Directions. *Psychological Inquiry, 26*, 130 – 137.

Do Primary School Teachers Know How Accurately Their Students Monitor and Regulate Their Learning?
Keywords: Mathematics/Numeracy, Metacognition, Primary Education, Self-regulated Learning and Behaviour
Presenting Author: Tamara Van Gog, Utrecht University, Netherlands; **Co-Author:**Sophie Oudman, Utrecht University, Netherlands; **Co-Author:**Janneke van de Pol, Utrecht University, Netherlands; **Co-Author:**Mariette van Loon, University of Zurich, Switzerland

To be able to help students to improve their self-monitoring and self-regulation skills, teachers should have an accurate idea of how well students can monitor and regulate their learning. We investigated how well primary school teachers can judge their students' monitoring and regulation accuracy and whether and how student characteristics influence this process. Thirty-three teachers, teaching 9-10 year old students, participated with their classes (N = 495 students). Students completed a multiplication and division task and made monitoring and regulation judgments before and after self-scoring their work. We measured (the accuracy of) teachers' judgments of their students' monitoring (before self-scoring) and regulation (before and after self-scoring) skills. Additionally, we measured teachers' perceptions of student characteristics (e.g., conscientiousness, general math ability, amount of teacher-student contact). Results showed that the teachers seemed to know that in general, their students made quite accurate monitoring and regulation judgments. However, they had difficulties with identifying those students who made substantially inaccurate judgments (for whom it is particularly important that the teachers can intervene). Teachers' perceptions of student characteristics, when taken together, explained substantial variance in (the accuracy of) teacher judgments of students' monitoring and regulation skills. Moreover, teacher judgments of students' regulation accuracy prior to self-scoring seemed to be somewhat biased by students' nationality. These findings and measures can ultimately contribute to the design of interventions to help teachers judge and develop their students' self-regulated learning skills.

Session F 15

23 August 2023 14:45 - 16:15
AUTH_T202
Single Paper
Learning and Instructional Technology, Motivational, Social and Affective Processes

Students' Interest and Curiosity

Keywords: Cognitive Skills and Processes, Emotion and Affect, Interest, Learning Analytics, Learning Approaches, Personality, Primary Education, Secondary

Education
Interest group: SIG 08 - Motivation and Emotion, SIG 27 - Online Measures of Learning Processes
Chairperson: Morane Stevens, KU Leuven - University of Leuven, Belgium

How intellectual curiosity and interest manifest in information seeking and knowledge attainment
Keywords: Interest, Learning Analytics, Learning Approaches, Personality
Presenting Author: Aki Schumacher, Hector Research Institute of Education Sciences and Psychology, University of Tübingen, Germany; **Co-Author:**Yvonne Kammerer, Stuttgart Media University, Stuttgart, Germany, Germany; **Co-Author:**Christian Scharinger, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Steffen Gottschling, Leibniz-Institut für Wissensmedien (IWM), Germany; **Co-Author:**Tobias Appel, Hector Research Institute of Education Sciences and Psychology, Germany; **Co-Author:**Lisa Bardach, University of Tübingen, Germany

Non-cognitive interindividual differences such as intellectual curiosity and domain-specific interest are important predictors of educational outcomes. But what exactly do intellectually curious or interested learners do differently that makes their learning more beneficial? This study used data from a lab experiment in which university students (N = 312, M_{age} = 23.3, SD_{age} = 3.04, 70.5% female) participated in a hypertext learning task to investigate the effects of intellectual curiosity and interest on (a) knowledge attainment (performance in a knowledge test), and (b) learning behaviour (information-seeking indicators extracted from log-file data). Additionally, we tested whether the combination of high intellectual curiosity and interest is particularly advantageous for knowledge acquisition in this task. Using latent profile analysis, we found four different information-seeking profiles (disengaged, superficial, broad, and deep-diving) that performed differently well on the knowledge test. Interindividual differences were related to information-seeking behaviour in that intellectually curious participants were more likely to revisit certain concepts (deep-diving information-seeking style) compared to seeking out many different hyperlinks (broad information-seeking style). On the other hand, highly interested participants were more likely to be broad information-seekers compared to being disengaged. The results showed that neither intellectual curiosity nor interest were directly related to knowledge attainment. The interaction between intellectual curiosity and interest did not significantly predict information-seeking behaviour and knowledge attainment. We discuss the theoretical and practical implications of using objective behavioural data to measure interindividual differences in learning processes.

The associations between children's trait and state curiosity
Keywords: Cognitive Skills and Processes, Emotion and Affect, Interest, Primary Education
Presenting Author: Jamie Jirout, University of Virginia, United States; **Co-Author:**Natalie Evans, University of Virginia, United States; **Co-Author:**Virginia Vitiello, University of Virginia, United States; **Co-Author:**Sharon Zumbrunn, Virginia Commonwealth University, United States

Curiosity is linked to learning behaviors and better learning (Shah et al., 2018), yet there is not yet enough known about curiosity to inform educational practice on how to promote it in learners (Authors, 2018). For example, curiosity research often focuses on studying either individual differences in curiosity (trait) or momentary curiosity (state), with few studies exploring associations between the two (Authors, 2012; Hassinger-Das & Hirsh-Pasek, 2018). Exploring this association was the main aim of the current study. Twenty-six children (age=7.9 years (*SD*=1.3); data collection ongoing) participated. Individual differences in trait curiosity were assessed using a self-report survey (e.g., "I ask questions to learn more about things"; five-point Likert scale). Two behavioral measures assessed state curiosity by the amount of information explored: in a free exploration task, children could see and hear up to seven interesting facts about nine different topics; in an uncertainty exploration task, children were constrained in how much they could explore across options varying in uncertainty level. Trait curiosity was high across age (*M*=3.99; *SE*=.16; no correlation with age *tau*=.126, *p*=.395) and related to exploration on the uncertainty task (*tau* = .336; *p* = .031; free exploration, *tau*=.008; *p*=.960). Qualitative findings of children's explanations for their exploration on the tasks and results from our full sample will be presented. Findings suggest the importance of providing children with opportunities to explore varying amounts of uncertainty with encouragement and low risk, rather than with more open-ended exploration opportunities, to encourage state curiosity and develop trait curiosity.

Integrating two lines of research on how children's state curiosity relates to their learning
Keywords: Cognitive Skills and Processes, Emotion and Affect, Interest, Primary Education
Presenting Author: Tessa van Schijndel, University of Amsterdam, Netherlands; **Co-Author:**Brenda Jansen, University of Amsterdam, Netherlands

Epistemic curiosity is considered to drive knowledge acquisition, but empirical support for this claim is fragmented and limited (Peterson, 2020). Two separate lines of research on children's curiosity-based learning can be distinguished: one focusing on memory for factual information as a learning outcome (e.g. Fandakova & Gruber, 2021), the other on exploratory behaviours as a learning outcome (e.g. Bonawitz et al., 2012). The present study aims at integrating these lines of research by adding a measure for children's willingness to explore subjects to an existing paradigm focusing on children's memory for factual information. In addition, we aim to study whether intelligence affects the effect of curiosity on memory. To this end we administered an adaptation of the Trivia-task (e.g. Fandakova & Gruber, 2021) to 36 10- to 12-year olds, and the RSPM (e.g. Hamel & Schmittmann, 2006) to a subset of this group. The results replicated those of Fandakova and Gruber: epistemic state curiosity was related to better memory performance in children, but no effect of a curious state on the recall of unrelated information was found. In line with the information gap theory (Loewenstein, 1994), curiosity also had a positive effect on children's willingness to explore. Last, a trend suggested that the curiosity memory effect might be higher for the high- than for the low-intelligence group. To conclude, this study took a first step in integrating two separate lines of research on curiosity-based learning, and contributed to building a theoretical foundation for educational interventions aimed at stimulating curiosity-based learning.

What do Chinese students perceive and experience about curiosity in schools?
Keywords: Cognitive Skills and Processes, Emotion and Affect, Interest, Secondary Education
Presenting Author: Xin Tang, Shanghai Jiao Tong University, China; **Co-Author:**Huier Zheng, University College London, United Kingdom

This study aimed to understand students' definition, experiences, perceptions and attitude towards curiosity from subjective and cross-cultural perspectives. Five open-ended questions regarding curiosity in schools were collected from 337 Chinese adolescents (age from 12 to 15). Through text analyses, we found that most things students curious about were related to subjects outside the classroom (about 70%), even though the question specified that the setting should be "at school". Although students were not curious about studying contents, classroom activities were reported as critical channels to facilitate their curiosity, suggesting the importance of pedagogy in promoting school curiosity. Finally, Chinese adolescents reported mixed attitude towards curiosity with most students held dialectical views of curiosity.

Session F 16

23 August 2023 14:45 - 16:15
UOM_A10
Single Paper
Learning and Social Interaction

Parental Involvement in Literacy Development

Keywords: Creativity/Divergent Thinking, Early Childhood Education, Informal Learning, L1/Standard Language Acquisition, Mixed-method Research, Parental Involvement in Learning, Quantitative Methods, Reading, Writing/Literacy
Interest group: SIG 05 - Learning and Development in Early Childhood
Chairperson: Wilfried Admiraal, Norway

Idioms exposure in shared book reading and child vocabulary growth: An exploratory study
Keywords: Early Childhood Education, L1/Standard Language Acquisition, Mixed-method Research, Parental Involvement in Learning
Presenting Author:JUNYI YANG, University of Oslo, Norway; **Co-Author:**Vibeke Grøver, University of Oslo, Norway; **Co-Author:**Joshua Lawrence, Univeristy of Oslo, Norway

Idioms make up an essential part of our language, and so children acquire idioms as part of their linguistic repertoire. Developmental research suggests that children as young as five can comprehend the literal meaning of idioms, yet we know little about how young children are exposed to idioms in natural discourse and how the idiom exposure might contribute to child language. This study followed thirty-three 3-to-5-year-old Chinese-Norwegian dual language learners, observed their idioms input during mother-child shared book reading, and assessed their Chinese vocabulary development three times over a year. We analyzed the conversation contexts of idiom instances and applied individual growth models to test the relations between idioms and child vocabulary growth. We found that Chinese mothers' use of idioms during shared book reading, even without discussion, served as a significant predictor for child receptive vocabulary growth. The current exploratory study shed light on idioms as specific language input, providing a presumably more nuanced contextual factor for child language development and practical significance for the home literacy environment.

Parent-Child Picture Book Co-creations as a Blessing in Uncertain Times
Keywords: Creativity/Divergent Thinking, Parental Involvement in Learning, Reading, Writing/Literacy
Presenting Author: Wai Ming Cheung, The University of Hong Kong, Hong Kong; **Presenting Author:**Serene Chan, The University of Hong Kong, Hong Kong

Learning has been greatly disrupted over the past few years because of the pandemic. While schools and policy makers are rethinking education in the new normal, parents can also play a very important role in helping their children develop literacy and language skills. In this study, seven parent-child dyads joined a picture book workshop conducted in a kindergarten. Parents learned about different types of picture books and strategies for reading with their children. The children, aged 5 to 6, co-designed and co-created picture books with their parents when school hours were greatly reduced. They read a specially written picture book with a set pattern based on the ten special features found on the island where their school was situated. Some parent-child picture book co-creations have shown children's observation power in collecting information for writing their book. A few children were able to go beyond their observations and imagine highly creative stories about topics they were passionate about. Using a multiple case study method, this study shows that reading picture books together is important for children's literacy development and a blessing in these uncertain times.

Patterns of infants' home literacy environment: threshold effects of family social risk factors
Keywords: Early Childhood Education, Informal Learning, Parental Involvement in Learning, Quantitative Methods
Presenting Author: Sabine Blaurock, Otto-Friedrich-University of Bamberg, Germany; **Co-Author:**Luisa Prokupek, Otto-Friedrich-University of Bamberg, Germany; **Co-Author:**Yvonne Anders, Otto-Friedrich-University of Bamberg, Germany

Although studies report on the significance of the home literacy environment (HLE) in the early years for early language acquisition, studies are primarily focused on the importance of family background characteristics for parent-child interactions. Little is known about which other social risk factors are associated with different facets of home literacy activities in infancy and toddlerhood. The present paper therefore investigates patterns emerge among families with different levels of social risk for informal (intentional and non-intentional) home literacy activities. Data were drawn from the German intervention project "Development and implementation of a digital pedagogical component to increase family stimulation quality" with a sample size of 221 parents of children with an average age of 13 months. Results reveal that the construct of HLE should already be considered in a differentiated way in families with infants. Families with a comparatively higher risk level stimulate their children less intentional and non-intentional than families with a lower risk level. Intentional activities, such as dialogical reading with the child, seem to be independent of family background characteristics. However, not all parents seem to be aware that non-intentional literacy activities, such as talking with the child in everyday situations, are also important for development of emergent literacy skills. Parental competences with regard to literacy stimulation might slightly compensate for the association between social risk factors and informal home literacy activities. Results are discussed regarding the potential of (digital) family education programmes for higher social risk families with infants.

Session F 17

23 August 2023 14:45 - 16:15
UOM_A02
Single Paper
Learning and Special Education

Using Eye Tracking for Students With and Without Learning Difficulties

Keywords: Classroom Assessment, Cognitive Skills and Processes, Eye Tracking, Inclusive Education, Learning and Developmental Difficulties, Mathematics/Numeracy, Quantitative Methods, Reading, Secondary Education, Special Education
Interest group: SIG 15 - Special Educational Needs
Chairperson: Antti Lehtinen, University of Jyväskylä, Finland

Strategies of students with learning difficulties in math number line tasks: An eye-tracking study
Keywords: Eye Tracking, Learning and Developmental Difficulties, Mathematics/Numeracy, Special Education
Presenting Author: Anna Lisa Simon, Universität zu Köln/ University of Cologne, Germany; **Presenting Author:**Maike Schindler, Universität zu Köln/ University of Cologne, Germany

Students with learning difficulties (LD) tend to have difficulties in various school subjects, one of which is mathematics. Mathematical skills are important for coping with everyday life. However, relatively little is currently known about the mathematical learning of students with LD and their particular or general difficulties in mathematics. In order to provide appropriate support for students with LD, research is needed on possible difficulties in mathematics and on what strategies they use. The number line is an important tool in mathematics education, especially in primary school, to support the development of mathematical skills and is used in mathematics teaching to foster students' number sense. However, it is currently not known how students with LD cope with the number line in mathematics teaching and how they could best benefit from the use of the number line. The aim of this study was to investigate if students with LD differ from students without LD in their strategy use to locate numbers on marked number lines, as they are used in mathematics teaching in many countries. In our empirical study with fifth-graders with LD (n=21) and without LD (n=156), we used eye tracking (ET) to investigate student strategies. Analyses of ET videos revealed significant group differences in strategy use and that students with LD used strategies less adaptively than students without LD. This indicates that students with LD are less proficient using the number line and that they could benefit from customized support.

Sublexical Processing in Finnish Typical and Compromised Reading Development
Keywords: Eye Tracking, Quantitative Methods, Reading, Special Education
Presenting Author: Lisa Hintermeier, University of Jyväskylä, Finland; **Co-Author:**Mikko Aro, University of Jyväskylä, Finland

The present study investigates sublexical processing in Finnish, a language with a highly transparent orthography and a rich, agglutinative morphology. More specifically, we aim to explore how the use of sublexical units (i.e. syllables and morphemes) changes throughout the course of typical and atypical reading development.Finnish second graders and fourth graders (including both typically developing readers and children indicating reading difficulties) were asked to conduct a lexical decision task in which they needed to decide whether a stimulus presented on a screen is a real Finnish word or not. The stimuli were shown under different conditions: either concatenated (talossa) or separated at the syllable (talos#sa) or morpheme (talo#ssa) boundary, and reaction times as well as eye movements were recorded simultaneously during the task. In addition, reading fluency assessments were conducted.Preliminary results revealed significant differences between the conditions in word versus pseudoword items across the reading fluency continuum, with older and more fluent children being more disrupted by the syllable and morpheme boundary conditions as compared to the concatenated condition when reading word items, while this did not seem to be the case for pseudoword items.The results of this study will help understanding how reading develops through the initial years of reading development and the gained knowledge can be used to design training programs for struggling readers, for example by supporting them to enhance the automatization of their word recognition skills.

Designing accessible assessment tasks: Impacts on student performance and engagement

Keywords: Classroom Assessment, Eye Tracking, Inclusive Education, Secondary Education
Presenting Author: Callula Killingly, Queensland University of Technology, Australia; **Presenting Author:**Linda Graham, Queensland University of Technology, Australia; **Co-Author:**Sonia White, Queensland University of Technology, Australia; **Co-Author:**Naomi Sweller, Macquarie University, Australia

To succeed in summative assessment, students need to understand task requirements; yet accessibility of critical information is often impeded by complex task sheets. This ARC Linkage Project is examining the impact of accessible task sheet redesign on student comprehension, visual engagement, and achievement. Students in Grade 10 in 2021 or 2022 were recruited from three partner secondary schools in Queensland, Australia. Students were assessed on baseline reading comprehension and screened for language and attention difficulties. In 2021, 73 current Grade 10 students were eye-tracked while they read their English assessment task for the first time. Afterward, a five-minute interview was conducted with each student to assess their comprehension of the task. Task sheets were then collaboratively redesigned with the English head of department of the respective school. To inform the redesign, visual engagement data and interview responses were triangulated with accessibility principles derived from previous task analysis work by Graham et al. (2018). Using the redesigned task sheets, 124 students who were in Grade 10 during 2022 were then eye-tracked and interviewed. Achievement on the task was compared in both cohorts, revealing higher results for the redesigned task sheet in comparison to the original task sheet, accounting for baseline reading comprehension. The redesign worked equally well for students with and without language and attention difficulties. Additionally, the redesigned task resulted in improved access to key information, as shown by visual engagement and interview responses. These findings showcase the significance of accessible task design in promoting student achievement and engagement.

Comparing Continuous and Discretized Tape Diagrams of Fractions: An Eye-Tracking Study with Adults
Keywords: Cognitive Skills and Processes, Eye Tracking, Mathematics/Numeracy, Secondary Education
Presenting Author: Sabrina Schwarzmeier, Technical University of Munich, Germany; **Co-Author:**Andreas Obersteiner, Technical University of Munich, Germany; **Co-Author:**Martha Wagner Alibali, University of Wisconsin-Madison, United States; **Co-Author:**Vijay Marupudi, Georgia Institute of Technology, United States

Fractions are challenging for many students. In particular, students often do not fully understand fraction magnitudes. Visualizations such as tape diagrams could be helpful in comparing fractions quickly and intuitively because the larger fraction can easily be identified visually. However, textbooks mostly use discretized tape diagrams (which include countable segments) rather than continuous tape diagrams (without countable segments). Although discretized tape diagrams facilitate direct mapping between the diagram and fraction symbols, continuous diagrams may encourage more holistic processing. We investigated adults' performance in a fraction comparison task using discretized and continuous tape diagrams. We used eye tracking to assess eye saccades in addition to assessing accuracy and response times. Participants compared continuous tape diagrams of fractions more accurately, faster, and with fewer within-diagram saccades. These results suggest that people are more efficient at using continuous visualizations compared to discretized visualizations to visually compare fraction magnitudes. The study supports recommendations to use continuous visualizations in the early phases of teaching fractions.

Session F 18

23 August 2023 14:45 - 16:15
UOM_R03
Poster Presentation
Higher Education, Teaching and Teacher Education

Teacher Professional Development

Keywords: Attitudes and Beliefs, Citizenship Education, Communities of Learners and/or Practice, Competencies, Curriculum Development, E-learning/ Online Learning, Higher Education, Immersive Technologies for Learning, Lifelong Learning, Pre-service Teachers, Qualitative Methods, Reasoning, Science Education, Secondary Education, Social Sciences and Humanities, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development, SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Julia Klug, Austria

Professional Knowledge in Pre-Service Teacher Education in Social Sciences: the SoWi-L study
Keywords: Competencies, Higher Education, Social Sciences and Humanities, Teacher Professional Development
Presenting Author: Sabine Manzel, Universität Duisburg-Essen, Germany; **Co-Author:**Dorothee Gronostay, TU Dortmund University, Germany

Social Science teachers need professional knowledge to offer students deeper learning processes for understanding politics and democracy. Following Shulman (1987), the professional knowledge is differentiated into subject-related content knowledge, pedagogical content knowledge and pedagogical knowledge and can be developed during teacher education. In contrast to Maths (e. g. COACTIV), there is hardly any data on subject-related knowledge for Social Sciences with its reference disciplines of political science, economics and sociology. An instrument for evaluating professional knowledge was designed by Weißeno, et al. 2013. However, economic and sociological expertise was not taken into account. Due to this research gap, a standardised test instrument SoWis-L was developed by the authors in 2019. For the first time the SoWis-L-test (71 items, multiple-choice-single-select-format) makes it possible to capture systematically and empirically the professional knowledge of teachers across the entire spectrum of the Social Science curriculum. The main study (N=500) is based on a quasi-longitudinal survey at three measurement points. There are significant increases in knowledge in Political Science and subject-didactic knowledge, but not in Economics and Sociology. There are significant positive correlations between the predictor gender and professional expertise. One goal is to encourage evidence-based research to improve the teacher education in Social Sciences.

Challenges of teacher educators in integrating research competence in graduation assignments
Keywords: Competencies, Curriculum Development, Higher Education, Teacher Professional Development
Presenting Author: Belinda Ommering, Utrecht University of Applied Sciences, Netherlands; **Co-Author:**Marloes van Dijk, Marnix Academie (PABO), Netherlands; **Co-Author:**Lisette Munneke, Utrecht University of Applied Sciences, Netherlands; **Co-Author:**Marjolijn Peltenburg, Marnix Academie, Netherlands; **Co-Author:**Miranda Timmermans, Marnix University of applied sciences, Netherlands

Professional higher education aims to deliver graduates able to use research competence for their profession. Conducting practice-oriented research resulting in a thesis in order to graduate no longer seems to fit this purpose, as opposed to working towards professional products for which research competence is needed. Marnix Academie (University of Applied Sciences, the Netherlands) initiated a curriculum change by redesigning its graduation phase in which students are stimulated to deploy research competence in order to deliver professional products. Action research is carried out parallel to redesigning the graduation phase, with an initial focus on the following research questions: 1) how did teacher educators integrate research competence within graduation assignments, and 2) what challenges do teacher educators face in integrating research competence in graduation assignments? Document analysis was conducted to answer the first question and semi-structured interviews with thirteen teacher educators were conducted to answer the second question. Document analysis revealed practical implications for further developing graduation assignments, such as emphasizing authentic professional products, explicitly informing students on the role of research competence in professional processes and products, striving for consistency in integrating research competence, and optimizing constructive alignment. Interviews disclosed teacher educators' satisfaction with content of current assignments and challenges entailing, among others, balancing student autonomy versus structuring learning opportunities, just-in-time peer feedback, increasing perceived relevance regarding research competence among students, and needs for collective teacher professionalization. The identified challenges will serve to guide next steps in professionalizing teacher educators and optimally integrating research competence in graduation assignments.

What quality features make online professional development for teachers effective?
Keywords: E-learning/ Online Learning, Lifelong Learning, Teacher Professional Development, Teaching/Instructional Strategies
Presenting Author: André Meyer, University of Potsdam, Germany; **Co-Author:**Marc Kleinknecht, Leuphana University Lueneburg, Germany; **Co-Author:**Dirk Richter, University of Potsdam, Germany

The number of online professional development (PD) activities for teachers has increased over the past decade. While there is evidence on characteristics of effective face-to-face PD, little is known about the quality of online PD activities. The present study investigates the quality of online PD activities as perceived by teachers, and the relationship between PD quality and teachers' satisfaction and their changes in practice. The study is based on survey data from N = 387 teachers who participated in a formal online PD activity. Our results indicate high levels of cognitive activation, as well as high clarity and structure of the online PD activity, and moderate levels of collaboration among participants in online PD. While all quality characteristics predict teachers' satisfaction, only cognitive activation and collaboration in online PD predict changes in teachers' professional practices.

Teacher Design Teams in secondary vocational education

Keywords: Curriculum Development, Qualitative Methods, Secondary Education, Teacher Professional Development
Presenting Author: Tina Gryson, Ghent University, Belgium; **Co-Author:**Katrien Strubbe, Ghent University, Belgium; **Co-Author:**Tony Valcke, Ghent University, Belgium; **Co-Author:**Ruben Vanderlinde, Ghent University, Belgium

The course Project Integrated General Subjects (PGS) which integrates the general subjects in Flemish vocational secondary education does not succeed in its goal to teach basic literacy and numeracy to the most vulnerable students (Janssens & Willem, 2022). PGS teachers struggle to adequately design the course since they frequently lack specific teacher training in PGS and/or struggle with the extensive and non-specific attainment targets (Sierens et al., 2017). Teacher Design Teams (TDTs) could provide a solution to this problem. Using TDTs, both immediately usable instructional materials are designed and participating teachers are trained. This qualitative research examines at four secondary schools, perceived as four case studies, what the conditions are for TDTs to succeed for the course PGS and how these TDTs prepare PGS teachers to teach more effectively. A TDT programme was implemented at the four schools during the school years 2020-2021 and 2021-2022. An important component in this study period is the COVID 19 measures and the educational reforms that rendered PGS's existence in the schools uncertain for a time. Interviews and reports are analysed with inductive thematic analysis. In terms of professional development, preliminary findings showed remarkable results in terms of instructional practices and attitudes towards the course PGS and collaborative design. Additionally, it became apparent that important structural prerequisites must be satisfied for training initiatives like a TDT to be successful in schools.

Social networks and key moments of student teachers' learning during internship

Keywords: Communities of Learners and/or Practice, Higher Education, Pre-service Teachers, Teacher Professional Development
Presenting Author: Marco Galle, University of Teacher Education Lucerne, Switzerland; **Co-Author:**Annelies Kreis, University of Teacher Education Lucerne (PH Luzern), Switzerland; **Co-Author:**Sonja Hiebler, University of Teacher Education Lucerne (PH Luzern), Switzerland; **Co-Author:**Esther Brunner, Thurgau University of Teacher Education, Kreuzlingen (PHTG), Switzerland; **Co-Author:**Sanja Stankovic, University of Teacher Education Thurgau, Switzerland

In teacher education, internships are considered as significant for the professional development of student teachers. From a social constructivist perspective, student teachers have collaborative learning opportunities during joint processing of professional issues. However, there is currently a lack of exploratory studies in which student teachers themselves describe their significant learning situations during internships and related actors therein. In a sub-study of the SNF-project "DiaMaNt", we investigate key moments of student teacher learning and analyze which actors are relevant and how they support them. Data has been collected using a survey instrument for social networks regarding key moments of professional development. 141 student teachers for primary education (1^{st}–6^{th} grade) listed key moments in their internship in a standardized PowerPoint file. Then, they selected the most significant one, and visualized the social network of relevant interactors regarding these moments from their perspective. Furthermore, student teacher audio recorded explanations about their network maps. The qualitative data were analyzed by a structuring qualitative content analysis, and the number and function of interactors were quantified. Based on that we created an overall network by quantitative procedures of social network analysis. First results showed that the key moments are mostly related to generic aspects of teaching quality. In the network maps of the most significant key moments, actors who are frequently present in the internship classes (mentor teacher, peer, and pupils) are mentioned more often and rated more significant for professional development than all other actors, for example, university-based teacher educators.

Virtual Reality as a Catalyst in the Transition Towards Student-Centred Methods and Beliefs

Keywords: Attitudes and Beliefs, Immersive Technologies for Learning, Science Education, Teacher Professional Development
Presenting Author: Sebastien Wall-Lacelle, University of Montreal, Canada; **Co-Author:**Bruno Poellhuber, University of Montreal, Canada; **Co-Author:**Christine Marquis, Cégep de Saint-Jérôme, Canada; **Co-Author:**Normand Roy, University of Montreal, Canada

In a context where the literature reports declining levels of interest, motivation, engagement and achievement in higher-education science classes, the use of VR simulations offers the potential to address the high level of abstraction, lack of contextualization and predominance of teacher-centred methods that are seen as sources of these issues. The pedagogical scenario into which these simulations are integrated is often seen as decisive for their effectiveness. Moreover, the teachers' adoption of technological tools is linked with a change towards student-centred methods and beliefs. This study presents the professional development of seven teachers who took part in our large-scale research on the use of desktop VR simulations in science classes using Clarke and Hollingsworth's interconnected model (2002). Our results show that all the teachers gained knowledge about scenarization that they intend to transfer to their practice outside of the project and that these changes were mainly brought about by student comments and results from student questionnaires. Teachers initially oriented towards teacher-centred methods and knowledge transmission described how they realized the importance of the emotional components of learning and how this realization may lead them to adopt more student-centred methods.

Teachers' professional growth in teaching social scientific reasoning

Keywords: Citizenship Education, Reasoning, Social Sciences and Humanities, Teacher Professional Development
Presenting Author: Thomas Klijnstra, University of Amsterdam, Netherlands; **Co-Author:**Gerhard Stoel, Radboud University, Nijmegen, Netherlands; **Co-Author:**Geerte Savenije, University of Amsterdam, Netherlands; **Co-Author:**Gerard Ruijs, University of Amsterdam, Netherlands; **Co-Author:**Carla Van Boxtel, University of Amsterdam, Netherlands

In social science education, students need to reason about social problems. However, social problems are often complex (e.g., they have multiple causes, consequences, and solutions) and reasoning is challenging. Hence, promoting students' ability to reason about political and social problems is relevant, but complex to teach. This study investigates how the use of educative materials in a professional development program contributes to teachers' professional growth in teaching reasoning skills in social science lessons. Previous research showed that a Teacher Development Program (TDP) can be effective when it is subject-specific and when educational materials are central. We used previous insights on characteristics of effective professionalization activities for the design of the TDP. In this study, ten social science teachers participated. Teachers' professional growth is examined by qualitative data analysis using pre- and post-interviews, a logbook and lesson observations of each teacher, and a questionnaire. The results showed an increment in teachers' knowledge of reasoning skills.Almost all teachers mentioned that the scaffolding of thinking steps in structured assignments and diagrams received more attention in their own lessons because of the TDP. Teachers shifted their focus in their lessons in such a way that they focused more on learning reasoning skills and applying the concepts more deeply by examining them in meaningful contexts. We expect that this will make the subject more meaningful for students *and* teachers. Teachers and teacher-educators can use these insights in practice. Ultimately, this can increase students' abilities to reason about social problems.

Session F 19

23 August 2023 14:45 - 16:15
UOM_R01
Poster Presentation
Cognitive Science, Higher Education, Learning and Social Interaction, Teaching and Teacher Education

Self-Regulated Learning and Behaviour

Keywords: Achievement, Assessment Methods, Cognitive Skills and Processes, Feedback, Higher Education, Instructional Design, Learning Strategies,

Metacognition, Pre-service Teachers, Primary Education, Self-regulated Learning and Behaviour, Simulation-based Learning, Social Aspects of Learning and Teaching, Social Interaction, Teacher Professional Development
Interest group: SIG 01 - Assessment and Evaluation, SIG 10 - Social Interaction in Learning and Instruction, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Ingvill Rasmussen, University of Oslo, Norway

Developing Self-Regulation as a Core Competency of Social-Emotional Learning: Action Research
Keywords: Instructional Design, Self-regulated Learning and Behaviour, Social Aspects of Learning and Teaching, Social Interaction
Presenting Author: Ronen Kasperski, Gordon College of Education, Israel; **Co-Author:**Merav Hemi, Gordon Academic College, Israel; **Co-Author:**Ditza Maskit, Gordon Academic College, Israel

This study describes the design and implementation of a self-regulation (SR) intervention embedded within a social-emotional learning (SEL) seminar for M.Ed. students. The intervention was rooted in the mimetic learning theory - a technique designed to replace actual experience with observing others interact in the same conditions. Content analysis was applied to analyze twenty-five written reports of M.Ed. students who participated in the seminar. The participants stressed that through the mimetic learning process they were able to become aware of the emotional load involved in complex interpersonal situations that occur in the daily school routine; identify the necessary SR skills needed to navigate the situation effectively; and expand the SR skills by receiving structured rules. This study adds an important perspective regarding applying mimetic learning as an effective means for developing SR skills among educators.

SRL Practices Growth Following Authentic Experience Program: One Teacher's Long Term Case Study
Keywords: Metacognition, Self-regulated Learning and Behaviour, Simulation-based Learning, Teacher Professional Development
Presenting Author: Orna Heaysman, Hemdat College of Education, Israel; **Co-Author:**Bracha Kramarski, Bar-Ilan University, Israel

Self-regulated learning (SRL) is a cyclic process of forethought, performance, and evaluation, in which the learner advances towards the learning goals. Even though it is agreed that SRL strategies can assist learners to increase their academic achievement, teachers refrain from teaching it for multiple reasons, including a lack of SRL theoretical knowledge, SRL practical skills, or beliefs in their ability to teach it. Although many studies on professional development (PD) were conducted for students' SRL, few studies have examined teachers' SRL practice following a PD program in the long term, using qualitative methodology. This study offers a unique program that combines theory and practice in SRL and follows the practices characteristics development of one teacher as a case study, before, immediately after the program, and 6 months later. The teacher was randomly chosen out of a focus group of teachers who were highly motivated to implement SRL practice and willing to participate in the long-term study. The training program includes interactive video analysis and simulations with real actors who can portray authentic characters of students in class by using *body language and tone of voice* We used authentic assessment measures: in-class video as well as an interview to gain a deeper understanding of the teacher's perception of events. The findings indicate a sustainable change in *SRL practice* that includes teacher and students talk-time, use of SRL promoting practice, and the physical location of the teacher and students in class. The study has implications for teacher professional development programs.

Enhancing student self-regulation through programmatic assessment
Keywords: Assessment Methods, Feedback, Higher Education, Self-regulated Learning and Behaviour
Presenting Author: Niels Bohnen, HAS University of Applied Science, Netherlands; **Co-Author:**Suzan van Ierland, HAS University of Applied Sciences, Netherlands

The terms flexible education, flexible learning and personalized education have been frequently used in scientific and professional literature in recent years. In implementing personalized learning, course programs in Dutch universities of applied sciences have started to implement or adapt educational concepts, to ensure possibilities for students to take control. One of the concepts that has been implemented is programmatic assessment. Programmatic assessment aims to stimulate students to monitor and self-regulate their learning. Programmatic assessment thus requires students to have self-regulating skills. In 2022, we conducted a pilot study to compare students' self-assessment on self-regulatory skills in a traditional versus a programmatic assessment programme. The results showed some promising trends. The aim of our current, longitudinal (4-year) study is therefore to follow students' development over time. Research is conducted at a Dutch university of applied sciences (4 year bachelor programme Applied Biology). To measure self-regulatory skills, a questionnaire (CP-SRLI) has been administered to two groups of students. Both groups follow the same bachelor programme, however, group 1 consists of students enrolled in a course program based on programmatic assessment and group 2 consists of students enrolled in a traditional course program. The questionnaires will be complemented with focus group discussions with students, and interviews with the students' personal coaches (teachers) in both the traditional and programmatic course program. In this symposium we will present the results after year 1.

Development of metacognitive monitoring in primary school and its association with achievement
Keywords: Achievement, Metacognition, Primary Education, Self-regulated Learning and Behaviour
Presenting Author: Elien Bellon, KU Leuven, Belgium; **Co-Author:**Wim Fias, Ghent University, Belgium; **Co-Author:**Bert De Smedt, KU Leuven, Belgium

Metacognitive monitoring, the subjective self-assessment of how well a (cognitive) task will be/is/has been performed (Nelson & Narens, 1990), is believed to be crucial for academic achievement and to develop substantially over primary school, including a shift from domain-specificity to domain-generality. However, to date there is a lack of empirical research in young primary school children specifically investigating this. The current research examined developmental changes in metacognitive monitoring in primary school children (i.e. grades 2, age 7-8 years, and grade 3, age 8-9 years) and its role in their arithmetic and spelling achievement. We investigated this issue in 579 second and third graders. Our data reveal that young primary school children already engage in efficient metacognitive monitoring and that metacognitive monitoring already plays a role in early academic achievement. Furthermore, our data suggest that the role of metacognitive monitoring is stable over academic development in young primary school children. Lastly, our results provide evidence for the emergence of domain-generality of metacognitive monitoring between second and third grade (i.e. 7-9-year-olds). Our findings might suggest novel ways to instruct metacognitive monitoring to primary school children, for example, by recommending instruction in metacognitive monitoring in each academic domain separately in early primary school, and only expecting it to transfer to other domains starting in third grade.

First-Graders' Persistence of Overconfidence Despite Feedback
Keywords: Cognitive Skills and Processes, Feedback, Metacognition, Self-regulated Learning and Behaviour
Presenting Author: Kristin Kolloff, University of Bern, Switzerland

AbstractMetacognitive experiences can be provided in the form of repeated feedback on monitoring accuracy to foster calibration, at least in adults. So far, only a few studies have investigated the possible effects of item-specific feedback on monitoring accuracy in young children. We investigated whether first-graders can benefit from repeated feedback in paired-associate memory tasks in terms of monitoring accuracy (discrimination between correct and incorrect answers). Over six sessions, $N = 112$ children evaluated whether they solved tasks correctly or not and provided item-specific confidence judgments. One group obtained only feedback about performance, whereas the other group was informed whether their confidence judgment matched performance. Overall effects of feedback on monitoring accuracy revealed a positive but constant discrimination score over time. Children have already developed a metacognitive monitoring awareness; however, the type of feedback did not lead to more fine-tuned monitoring skills. Surprisingly, children in both groups seemed to remain remarkably optimistic in their confidence. The findings imply that first-graders do not easily take advantage of available feedback to lower their confidence. *Keywords:* metacognition, monitoring, confidence judgments, feedback, intervention, multi-level analysis

Pre-service teachers' self-regulated learning skills and skills to scaffold self-regulated learning
Keywords: Feedback, Learning Strategies, Pre-service Teachers, Self-regulated Learning and Behaviour
Presenting Author: Piia Naykki, University of Jyväskylä, Finland; **Co-Author:**Laura Hirsto, University of Eastern Finland, Finland; **Co-Author:**Marjaana Veermans, University of Turku, Finland

Studies have shown that skills to self-regulate learning (SRL) can be supported, but teachers rarely engage in the pedagogical practices that are in support for

SRL development. The aim of this study is to explore pre-service teachers' self-reported SRL skills and skills to scaffold SRL. The research questions are: 1. How is the study phase related to the pre-service teachers' level of SRL skills and skills to scaffold SRL, 2. How is the amount of teaching practice related to pre-service teachers' SRL skills and skills to scaffold SRL, 3. How do pre-service teachers' SRL skills explain their skills to implicitly and explicitly scaffold SRL? The questionnaire data from 112 pre-service teachers was collected in four teacher education institutes in Finland. The results indicate that pre-service teachers in the beginning phase regulate task value more often and implement implicit explanations when scaffolding SRL. Students with less experience of teaching practice self-regulate their learning more often in general and by regulating task value. No significant difference was found in terms of the amount of teaching practice for explicit or implicit scaffolding of SRL. The results further indicate that self-efficacy for promoting SRL explains 37.2% for explicit scaffolding and 8% for implicit scaffolding. Skills to self-regulate own learning process explains 28.5% for explicit scaffolding and 6.5% for implicit scaffolding. Regulation of task value together with task interest explains 19.8% for explicit scaffolding and 8.2% for implicit scaffolding. The findings provide information for the development of teacher education.

Session F 20

23 August 2023 14:45 - 16:15
UOM_R02
Poster Presentation
Assessment and Evaluation, Developmental Aspects of Instruction, Learning and Instructional Technology, Lifelong Learning

Vocational and Workplace Learning

Keywords: Assessment Methods, Classroom Assessment, Competencies, Emotion and Affect, Health-care Education, Immersive Technologies for Learning, Informal Learning, Instructional Design, Lifelong Learning, Mixed-method Research, Qualitative Methods, Simulation-based Learning, Vocational Education and Apprenticeship Training
Interest group: SIG 01 - Assessment and Evaluation, SIG 08 - Motivation and Emotion, SIG 14 - Learning and Professional Development
Chairperson: Garvin Brod, Germany

Antecedents and Effects of Boredom during Classroom Instruction at Vocational Schools
Keywords: Emotion and Affect, Instructional Design, Mixed-method Research, Vocational Education and Apprenticeship Training
Presenting Author: Katrin Rehrl, Paris - Lodron University Salzburg, Austria

Boredom in classroom is a phenomenon that should not be underestimated in vocational schools and is influenced by factors of classroom design (Kögler & Wuttke, 2012). Previous studies on the experience of boredom have focused on secondary school students, while the empirical evidence on vocational school students is comparatively limited.This is where the present study comes in: Based on the control-value theory (Pekrun, 2006) and the basic dimensions of teaching quality (Praetorius et. al, 2018), we investigate which characteristics of teaching quality can explain vocational students' boredom as well as its change in the subject.For this purpose, a longitudinal mixed-methods study in an explanatory sequential design (QUAN à qual) is conducted. Pre- and posttesting (online-questionnaire) will take place in a vocational school block (Ø 9.33 weeks). Participants are 215 (longitudinal section [t1: 522; t2: 284]) learning manual and technical trades. An interview (online) study with 15 students forms the qualitative part. Based on the preliminary theoretical considerations, it is expected that the experience of boredom changes over the course of a school block and that this change can be explained by the perceived instructional design. Implications for emotion-favorable instructional design can be derived from the longitudinal SEM models and the interviews.

Using desktop virtual reality simulation in nursing education: a cluster randomized controlled trial
Keywords: Health-care Education, Immersive Technologies for Learning, Instructional Design, Simulation-based Learning
Presenting Author: Minna Ruoranen, University of Jyväskylä, Finland; **Co-Author:**Ville Heilala, University of Jyväskylä, Finland; **Co-Author:**Jaana Mäkelä, JAMK University of Applied Sciences, Finland; **Co-Author:**Jeri Varjosalo, University of Jyväskylä, Finland; **Co-Author:**Paavo Räty, University of Jyväskylä, Finland; **Co-Author:**Katriina Sipiläinen, University of Jyväskylä, Finland; **Co-Author:**Toni Pekkola, JAMK University of Applied Sciences, Finland; **Co-Author:**Tommi Kärkkäinen, University of Jyväskylä, Finland; **Co-Author:**Raija Hämäläinen, University of Jyväskylä, Finland

The global nursing shortage is a critical concern in healthcare. Technology-enhanced learning (TEL) is expected to provide effective and efficient support for medical education in uncertain times and under changing societal, economic, and educational settings. For example, teaching and learning practices that utilize virtual simulations have been gaining popularity in nursing education. Specifically, desktop virtual reality (dVR) simulations utilizing 360-video provide scalable and low-cost solutions to create educational content. Our study examines the educational use of dVR simulation in the context of nursing education and learning a common medical assessment skill: the ABCDE approach. The study aims to assess what is the difference in learning outcomes between dVR simulation and live simulation (i.e., a simulation involving actor patients). A cluster randomized controlled trial (cRCT) design (n = 100/100) is used to compare the effectiveness of dVR simulation and live simulation in learning the ABCDE approach among Finnish nursing students. The dVR simulation material is created using Thinglink, which is an online platform for creating virtual media that is accessible without dedicated VR hardware. A unique feature of our study is that the dVR learning material is created by the teaching staff in the medical school. Thus, the results provide evidence and a realistic scenario that other educational institutions could follow to develop their pedagogical approaches in practice. Also, the results will increase knowledge about the added value of VR in teaching and learning in nursing education.

Justifying the diploma decision differently: how do teacher teams design their new assessment plan?
Keywords: Assessment Methods, Classroom Assessment, Competencies, Vocational Education and Apprenticeship Training
Presenting Author: Judith Gulikers, Wageningen University, Netherlands; **Co-Author:**Liesbeth Baartman, University of Applied Sciences Utrecht, Netherlands

Many educational institutions are changing the ways they think about assessment of student learning. Currently, vocational education mostly uses externally developed, end-of-the-program, performance assessments. This practice leads to a strict divide between instruction/learning and assessment, not fostering optimal student development. This proposal reports on a two-year participatory project with fourteen teams for vocational education institutions who all are changing towards more programmatic assessments for making high stakes (i.e. diploma) decisions about their students as well as more optimally fostering students learning throughout their educational trajectory. While theoretical principles for programmatic assessment exist (Heeneman et al., 2022), different design decisions are made in practice, leading to different actual assessment programs with different implications and effects. Moreover, they are developed and studied in the higher – mostly medical – education context. Via a rich data collection from the fourteen participating teams, this multiple case study identifies themes that show differences and commonalities in design decisions made by the teams. The identified themes are vision, quality criteria, educational setup, data-points, feedback and formative assessment, decision. Additionally, success and fail factors were identified. This project makes programmatic assessment, and its variations, more tangible in the vocational education context. Largely supporting findings from theory and higher education practice (Authors, 2022) though also showing some context specific elements.

Developing Relational Work as a Design Tool in activities with health professionals
Keywords: Health-care Education, Informal Learning, Lifelong Learning, Qualitative Methods
Presenting Author: Koula Charitonos, The Open university UK, United Kingdom; **Co-Author:**Littlejohn Allison, University College London, United Kingdom; **Co-Author:**Saraswati Dawadi, The Open University, United Kingdom, United Kingdom; **Co-Author:**Abhinav Vaidya, Public Heath Research Development Nepal / Kathmandu Medical College, Nepal; **Co-Author:**Santosi Giri, Public Health Research Development Nepal, Nepal; **Co-Author:**Alex Owusu-Ofori, Kwame Nkrumah University Of Science and Technology, Ghana; **Co-Author:**Fereshte Goshtasbpour, The Open University, United Kingdom, United Kingdom

This paper focuses on relations that emerge between professionals in different roles in the public health systems in low-and-middle income countries (LMICs) as they engage in activities related to the surveillance of antimicrobial resistance (AMR). It illustrates the potential for a designed learning activity to promote relational expertise among participants based at the same workplace. Grounded in sociocultural theory and leveraging theoretical contributions from the field of professional learning, we draw on qualitative digital data across a period of six months to examine the development of an AMR Toolkit - a set of activities to

encourage dialogic reflection about new sets of relations that are needed as work evolves - and the organization of activities that the Toolkit enabled. Analysis of accounts generated by lead participants (written proformas (n=12); interviews (n=11)) across 12 public health organisations in two LMICs reveal how the concept of relational expertise combined with maintaining a view of the new object of activity in the local system serve in the design of an artefact that supports professionals to come to understanding and negotiate wider work arrangements and practices, envision new practices and engage in re-configurations of relational aspects of work.

Session F 21

23 August 2023 14:45 - 16:15
UOM_R04
Poster Presentation
Cognitive Science, Higher Education, Instructional Design, Teaching and Teacher Education

Motivation, Interest and Achievement

Keywords: Achievement, Anxiety and Stress, Attitudes and Beliefs, Cognitive Skills and Processes, Competencies, Conceptual Change, Developmental Processes, Engagement, Higher Education, Interest, Motivation, School Effectiveness, Science Education, Secondary Education, Teaching Approaches, Teaching/Instructional Strategies
Interest group: SIG 03 - Conceptual Change, SIG 04 - Higher Education, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Annabel Watson, University of Exeter, United Kingdom

The development of math competence and its relation to math interest
Keywords: Competencies, Developmental Processes, Interest, School Effectiveness
Presenting Author: Triinu Kilp-Kabel, Tallinn University, Estonia

Understanding mathematics and the ability to use mathematics in different situations is helpful for a successful life. Through researching the development of math competence we can better understand what supports and what hinders math competence development. The better we understand how math competence develops, the easier it is to support students' math competence development and to pinpoint what aspects need intervention. In addition, interest has been related to math ability. The aim of the current study is to examine how math competence develops from 3rd to 5th grade, taking into account students' knowledge profiles and math-related interest using a person-oriented approach. Math competence is analyzed using computer-based tests that assess: 1) conceptual knowledge by using word problem solving tasks, 2) procedural knowledge by using calculation and conversion tasks, and 3) competence by using novel problem tasks. Students' math interest is assessed through a questionnaire (for example: "I enjoy calculation and math-related tasks") where the answers are on a 5-point Likert type scale.

Value and Utility: What Students Learn and Transfer from a Graduate Motivation Course
Keywords: Attitudes and Beliefs, Conceptual Change, Engagement, Motivation
Presenting Author:BOBBY HOFFMAN, University of Central Florida, United States

Knowledge transfer is the "ultimate aim of teaching" (McKeough et al., 2013, p. 1). Although researchers thoroughly examine the importance of teaching for transfer, little is known about precisely what students transfer when taking specific graduate courses in educational psychology. As such, a grounded theory, qualitative methodology employing open, axial, and selective coding was used to determine what graduate students gain, apply, and transfer when taking a motivation course. Results analysis revealed minimal variance among student conceptions of the value and utility of motivation knowledge. Recurring themes suggested that the motivation course experience generated greater self-awareness, acceptance or revision of self-beliefs, agentic engagement, and openness toward changing unproductive learning strategies. Suggestions for cultivating value and enhancing transfer during motivation instruction are discussed.

Interests and motivation in secondary education in Flanders
Keywords: Achievement, Interest, Motivation, Secondary Education
Presenting Author: Merel Dutry, Ghent University, Belgium; **Co-Author:**Laura de Ruijter, Ghent University, Belgium; **Co-Author:**Nicolas Dirix, Ghent University, Belgium; **Co-Author:**Stijn Schelfhout, Ghent University, Belgium; **Co-Author:**Wouter Duyck, Ghent University, Belgium

It is important that students choose a study program that matches their interests from the very beginning of their educational career, as there are many negative consequences associated with a mismatch between students and their education, both on personal and on societal level. Although previous research has already shown that interests and motivation are important factors in predicting study success in higher education, there is relatively little research involving younger pupils in secondary education. In this study, we investigate the relationship between interests, motivation and school results in secondary education in Flanders. A sample of 867 pupils completed a RIASEC interest-inventory and a motivation scale in the beginning of the school year, their school results will be collected at the end of the school year.

Promoting interest in high school science among Palestinian students in East Jerusalem
Keywords: Interest, Science Education, Secondary Education, Teaching Approaches
Presenting Author: Mohamed Amine Mahhou, University of Quebec in Montreal, Canada; **Co-Author:**Olivier Arvisais, Université du Québec à Montréal (UQAM), Canada; **Co-Author:**Patrice Potvin, Université du Québec à Montréal, Canada

Many researchers have attempted to understand the reasons behind the decline in interest in science among students during high school as well as ways in which it can be corrected. However, the scientific literature on this topic mostly includes studies that were conducted in highly institutionalized educational settings, and under stable political conditions. There is much less scientific literature when it comes to educational systems under great pressures. The Palestinian educational system in addition to being chronically affected by the lack of resources, is constantly challenged by such numerous acts of political violence affecting its different actors and sectors. Local researchers have indicated that Palestinian students show little interest in learning science. In this study, two concepts are put forward. First, the notion of *situational interest*, and secondly *contextualization of learning*.This research therefore proposes to develop, in collaboration with teachers, a contextualized pedagogical situation that has the potential to stimulate interest in science among East Jerusalem high school students, and then to test it with their students. Our hypothesis is that we will record a positive gain when compared to a regular pedagogical intervention. To test this hypothesis, we measured general interest first and secondly to assess the effect of our intervention we used the *situational interest questionnaire.* Our results appear to show that it is indeed possible to stimulate students' situational interest in science when they are offered activities that provide them the opportunity to learn withing a context.

A Study on the Effectiveness of Encouragement from Friends in Recoverable Failure Situations
Keywords: Achievement, Anxiety and Stress, Higher Education, Motivation
Presenting Author: Maki Nakamura, Kagoshima University, Japan; **Co-Author:**Kumiko Yoshitake, Nagasaki Junshin Catholic University, Japan; **Co-Author:**Maori Urakawa, Nagasaki Junshin Catholic University, Japan

In situations of failure during student life, encouragement and comfort from friends, the adolescent's "significant others," are considered effective to move on. However, there are some students who cannot accept encouragement. Therefore, this study examined what kind of encouragement from close friends would be accepted by students within four types of attachment patterns (Secure, Preoccupied, Dismissing, Fearful) in a serious failure situation, a delayed assignment submission situation. An internal working model scale was conducted with 121 university students (53 males and 159 females). In addition, they were asked how receptive they were to eight types of encouragement (empathy, perspective shift, advice, encouragement, assistance respecting the other person's pace, different topics or jokes, indirect encouragement, physical contact). The results of a two-factor analysis of variance with attachment pattern 4 ×encouragement method 8 were as follows: (1) Preoccupied and Fearful groups were less likely to accept encouragement from friends than the Secure and Dismissing groups. (2) Among the methods, for empathy, perspective shift, and advice, the Preoccupied and Fearful students were as likely to accept them as the Secure and

Dismissing students, while for encouragement, they were less likely to accept encouragement from their friends than the Secure and Dismissing types. These results indicate that even encouragement from close friends requires some thought in the way the encouragement is given, since different types of attachment are more or less likely to accept it.

The effects of cognitive and noncognitive skills on achievement in higher education: SEM analysis
Keywords: Achievement, Cognitive Skills and Processes, Higher Education, Motivation
Presenting Author: Sofie Van Cauwenberghe, Ghent University, Belgium; **Co-Author:**Nicolas Dirix, Ghent University, Belgium; **Co-Author:**Stijn Schelfhout, Ghent University, Belgium; **Co-Author:**Wouter Duyck, Ghent University, Belgium

Why does someone succeed in the first year of higher education; while others seem to struggle? Choosing a suitable study program is a challenging process for prospective students. First students have to find a program of their interest and make an attainable choice. Secondly, they need to achieve study success if they want to stay on track to acquire a degree. Research on study achievement focuses either on cognitive skills, or on motivation, interests and other noncognitive skills. However, interrelations between cognitive and noncognitive skills in higher education achievement are understudied. McGrew (2022) developed the Cognitive-Affective-Motivation Model of Learning (CAMML) which is a framework for integrating affective (Big 5), cognitive (CHC theory) and motivational factors. This integrative framework hypothesizes that the interrelations between cognitive and noncognitive skills predict the effectiveness with which students are ready to learn. The present study sets out to test this framework in a specific higher education context. Prospective students (N = 5679) in Flanders (Belgium) were questioned on different components of the framework. According to structural equation modeling, our data were adequate to a good fit with the theoretical framework. Preliminary results showed that cognitive skills remain the major factor towards more study efficiency, but the noncognitive abilities and interests also play an important role. We argue that study orientation and counseling tools can improve when focusing on both cognitive and noncognitive skills.

Epistemic Beliefs and Interest as Predictors of Student Teachers' Attitudes towards Deep Learning
Keywords: Attitudes and Beliefs, Cognitive Skills and Processes, Motivation, Teaching/Instructional Strategies
Presenting Author: Christian Brandmo, University of Oslo, Norway; **Co-Author:**Helge I. Stromso, University of Oslo, Norway; **Co-Author:**Øistein Anmarkrud, University of Oslo, Norway; **Co-Author:**Leila Ferguson, Kristiania University College, Norway; **Co-Author:**Ivar Bråten, University of Oslo, Norway

In the context of a national curriculum reform, this study aimed to explore how two types of epistemic justification and interests are related to preservice teachers' attitudes towards a much-debated pedagogical principle: the deep learning approach. The deep learning approach emphasises greater concentration on less subject matter over time to promote well-organised, principled and transferable knowledge and metacognitive reflection among students. Deep learning has become a pervasive principle of the new national curriculum launched in Norway in 2020. Nevertheless, this principle has been met with much debate and controversy, as experts and practitioners have taken different positions. Given this context and based on previous research on epistemic cognition and motivation, we investigated whether personal justification and interests are predictors of student teachers' attitudes towards deep learning. Findings based on data from 150 student teachers indicated that epistemic justification beliefs and interest in educational issues in general predicted a more positive stance towards deep learning. However, personal justification appeared to be a more potent predictor of attitudes than justification by authority. Moreover, personal justification was found to interplay with interest, which fully mediated the relationship between personal justification and attitude. These and other relationships, as well as their implications, will be further elaborated on and discussed.

Session F 22

23 August 2023 14:45 - 16:15
UOM_GYM
Roundtable
Assessment and Evaluation, Instructional Design, Teaching and Teacher Education

Eye Tracking in Instruction and Assessment

Keywords: Assessment Methods, Cognitive Skills and Processes, Eye Tracking, Learning Analytics, Mathematics/Numeracy, Misconceptions, Pre-service Teachers, Social Sciences and Humanities, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 01 - Assessment and Evaluation, SIG 10 - Social Interaction in Learning and Instruction
Chairperson: Jimmy van Rijt, Tilburg University, Netherlands

Teaching Visual Problem-Solving: Understanding how Experts Transfer Visual Expertise to Novices
Keywords: Cognitive Skills and Processes, Eye Tracking, Social Sciences and Humanities, Teaching/Instructional Strategies
Presenting Author: Christine van Nooijen, Erasmus University Rotterdam, Netherlands

Visual problem-solving is a critical 21st-century skill in various domains, including the social sciences. It is often developed in expert-novice interaction. Differences between experts and novices have been identified in a variety of domains, such as (but not limited to) sports and game domains like soccer and chess, and vocational domains spanning from air traffic control to surgery. Yet the process by which this expertise is transferred to novices is still understudied. This project aims to investigate verbal and non-verbal expert-novice interactions to uncover effective practices for developing this skill in complex visual tasks in the social sciences domain; specifically, forensic criminology. We record expert-novice interactions to study which scaffolding strategies experts in visual problem-solving use to diagnose and assist the novice's learning process, with a focus on the use of cueing and chunking strategies. Cueing strategies are perceptual; attention is guided to a specific point, influencing attention allocation. Chunking strategies are cognitive; concepts are grouped together to show relations between and within the information. These scaffolding strategies may manifest in both verbal and nonverbal behaviours. We use mobile eye-tracking, audio and video recording to study the effects of these actions on novices' visual perception, attention allocation and performance. By understanding which cueing and chunking strategies are used, and how, we hope to improve our understanding of expertise transfer. This understanding will allow us to develop instructional and scaffolding interventions to assist novices in gaining confidence and proficiency in visual problem-solving faster, and experts in optimally transferring their knowledge.

Investigating pre-service teachers' sense-making of educational dashboards using multichannel data
Keywords: Eye Tracking, Learning Analytics, Pre-service Teachers, Teacher Professional Development
Presenting Author: Clara Schumacher, Humboldt Universität zu Berlin, Germany; **Co-Author:**Roger Azevedo, University of Central Florida, United States; **Co-Author:**Dirk Ifenthaler, University of Mannheim, Germany

With the increased availability of educational data, it is expected that teachers make use of them for educational decision-making. Such data are often visualized on dashboards. Interpreting and using educational data is considered complex and demands educational data literacy of teachers. Hence, this work-in-progress experimental study investigates pre-service teachers' interaction with a teacher dashboard either after having received training or no training while we collected their multichannel data (e.g., eye-tracking, think-aloud, logfile data). Results should give insights into pre-service teachers' sense-making of the educational data, and if a short training can support educational data literacy. The findings could be used for designing teacher dashboards, supportive functions (e.g., explanations of algorithms, possible interventions) and trainings on educational data literacy.

Using Multimodal Data to Diagnose Probabilistic Misconceptions via an Online Diagnostic Tool
Keywords: Assessment Methods, Eye Tracking, Mathematics/Numeracy, Misconceptions
Presenting Author: Daryn Dever, University of Central Florida, United States; **Co-Author:**Roger Azevedo, University of Central Florida, United States

Probabilistic reasoning is a fundamental component for developing learners' rational thinking and statistical literacy. Despite the importance of this reasoning, learners' fundamental understanding is severely impacted by misconceptions regarding probability that persist through adulthood. Several attempts have been made to diagnose probabilistic misconceptions using concept inventories with multiple-choice items relating directly to a particular misconceptions, though these inventories can be largely unreliable and inconsistent due to measurement errors. As such, it is essential to collect multimodal data to triangulate the presence of

a misconception to later introduce remediation methods. This paper explores the methodologies, preliminary findings, future directions, and challenges of an on-going study (N=8) which uses a combination of eye tracking, concurrent verbalizations, log-files, and self-reports to accurately diagnose when learners demonstrate misconceptions.

Session F 23

23 August 2023 14:45 - 16:15
UOM_A04
Workshop
Instructional Design

Reinvigorating reading as an imaginative, vital experience for young people

Keywords: Communities of Learners and/or Practice, Comprehension of Text and Graphics, Engagement, Reading
Interest group: SIG 02 - Comprehension of Text and Graphics

How actively engaged are teenagers when they read literary texts at school? This workshop focuses on a seven-year Australian qualitative research and professional learning project involving secondary students and English teachers in 44 diverse secondary schools. Findings suggest that for too many contemporary young people, the reading experience at school involves a murky mix of mind wandering, fake reading, strategic regurgitation, and polite compliance. Drawing upon student interviews and students' metaphorical drawings of reading, as well as broader research into reading processes, the researchers worked collaboratively with English teachers to develop, implement, and evaluate a framework of reading capabilities to inform instructional design and formative assessment. The framework describes reading as an imaginative act fueled by connection-making, visualisation, embodied involvement, dialogic interaction, and metacognition. In this workshop, participants will learn about the qualitative approaches used to gather insights into students' complex and diverse reading experiences. Participants will encounter the Reading Capability Framework and actively participate in associated reading activities trialed and evaluated by teachers which aim to involve students actively and meaningfully in reading so that deep understandings develop. Dialogue will be used to collaboratively examine what readers do in their heads as they read and to further explore the implications for effective teaching.

Reinvigorating reading as an imaginative, vital experience for young people
Presenting Author: Amanda McGraw, Federation University Australia, Australia

How actively engaged are teenagers when they read literary texts at school? This workshop focuses on a seven-year Australian qualitative research and professional learning project involving secondary students and English teachers in 44 diverse secondary schools. Findings suggest that for too many contemporary young people, the reading experience at school involves a murky mix of mind wandering, fake reading, strategic regurgitation, and polite compliance. Drawing upon student interviews and students' metaphorical drawings of reading, as well as broader research into reading processes, the researchers worked collaboratively with English teachers to develop, implement, and evaluate a framework of reading capabilities to inform instructional design and formative assessment. The framework describes reading as an imaginative act fueled by connection-making, visualisation, embodied involvement, dialogic interaction, and metacognition. In this workshop, participants will learn about the qualitative approaches used to gather insights into students' complex and diverse reading experiences. Participants will encounter the Reading Capability Framework and actively participate in associated reading activities trialed and evaluated by teachers which aim to involve students actively and meaningfully in reading so that deep understandings develop. Dialogue will be used to collaboratively examine what readers do in their heads as they read and to further explore the implications for effective teaching.

Session F 24

23 August 2023 14:45 - 16:15
UOM_R05
Workshop
Teaching and Teacher Education

Building bridges between research and schools: Feedback to primary education teachers on handwriting

Keywords: Educational Technologies, Feedback, Synergies between Learning / Teaching and Research, Writing/Literacy
Interest group: SIG 12 - Writing

The digitization of pupils´ handwriting samples together with platforms for collaboration open new spaces to work with teachers around writing. Through these platforms, you can share files and videos of the writing processes with teachers of the next course, offer feedback to and have synergies in the work environment. This digitization can contribute to the early detection of difficulties regarding students' written competence. Several reasons lead us to carry out the detection in the first cycle of primary school (6-8 years): 1) quickly made legible letters and careful spelling have a substantial influence on the quantity and quality of the texts. 2) the collected samples are short, and their analysis does not take much time. 3) our administration wants to implement the Response to Intervention model, where detection is fundamental. Even though there are international guidelines for teachers on how to detect writing difficulties, we still need to get down to it. We have collected and given feedback on digital writing samples (alphabet test, word copy and text created from an image) to five tutors, responsible for 32 students in the first year and 51 in the second year, in a public school in the Basque Country. Our contribution aims to: outline key concepts on the writing of the theoretical model by Berninger & Winn (2006); teach how to digitize writing samples using the smart pen, digital paper, and the HandSpy system; use platforms like Padlet and Wix to answer questions and offer feedback.

Building bridges between research and schools: Feedback to primary education teachers on handwriting
Presenting Author: Irune Ibarra, University of the Basque Country, Spain; **Presenting Author:**Asuncion Martinez-Arbelaiz, University of the Basque Country, UPV/EHU, Q 4818001B, Spain; **Co-Author:**Jose María Arriola, University of the Basque Country, Spain

The digitization of pupils´ handwriting samples together with platforms for collaboration open new spaces to work with teachers around writing. Through these platforms, you can share files and videos of the writing processes with teachers of the next course, offer feedback to and have synergies in the work environment. This digitization can contribute to the early detection of difficulties regarding students' written competence. Several reasons lead us to carry out the detection in the first cycle of primary school (6-8 years): 1) quickly made legible letters and careful spelling have a substantial influence on the quantity and quality of the texts. 2) the collected samples are short, and their analysis does not take much time. 3) our administration wants to implement the Response to Intervention model, where detection is fundamental. Even though there are international guidelines for teachers on how to detect writing difficulties, we still need to get down to it. We have collected and given feedback on digital writing samples (alphabet test, word copy and text created from an image) to five tutors, responsible for 32 students in the first year and 51 in the second year, in a public school in the Basque Country. Our contribution aims to: outline key concepts on the writing of the theoretical model by Berninger & Winn (2006); teach how to digitize writing samples using the smart pen, digital paper, and the HandSpy system; use platforms like Padlet and Wix to answer questions and offer feedback.

Session F 25

23 August 2023 14:45 - 16:15
UOM_A07
Workshop
Learning and Social Interaction

Knowing Your ABCs: Asset Based Communication for Actionable Learning Interventions

Keywords: Communication Skills, Ethics, Learning Analytics, Quantitative Methods
Interest group: SIG 17 - Methods in Learning Research

Asset-based narratives consider the funds of knowledge, values, skills, and identities that students bring to the table as assets to their learning. Narratives matter in that they are used to construct policies, curricula, and educational interventions that impact students. In this workshop, participants will interact with anonymized data to construct asset-based narratives for learners. Importantly, participants will define actionable insights from the data, directed at communication with different stakeholders (e.g., students, educators, other researchers). All activities will be guided by the data feminism framework, which considers the ways data narratives can challenge unequal power structures. Participants will leave the workshop with increased understanding of how to construct asset-based narratives of learners, and form actionable insights for different stakeholders. We expect this workshop to contribute to the ongoing conversation on ethical processes for collecting, analyzing, and disseminating data about students.

Knowing Your ABCs: Asset Based Communication for Actionable Learning Interventions
Presenting Author: Angela Stewart, University of Pittsburgh, United States; **Co-Author:**LuEttaMae Lawrence, Utah State University, United States; **Co-Author:**Nikki Lobczowski, McGill University, Canada; **Co-Author:**Stephen Hutt, University of Denver, United States

Asset-based narratives consider the funds of knowledge, values, skills, and identities that students bring to the table as assets to their learning. Narratives matter in that they are used to construct policies, curricula, and educational interventions that impact students. In this workshop, participants will interact with anonymized data to construct asset-based narratives for learners. Importantly, participants will define actionable insights from the data, directed at communication with different stakeholders (e.g., students, educators, other researchers). All activities will be guided by the data feminism framework, which considers the ways data narratives can challenge unequal power structures. Participants will leave the workshop with increased understanding of how to construct asset-based narratives of learners, and form actionable insights for different stakeholders. We expect this workshop to contribute to the ongoing conversation on ethical processes for collecting, analyzing, and disseminating data about students.

Session G 1

23 August 2023 17:00 - 18:30
AUTH_CH
Invited Symposium
Assessment and Evaluation, Instructional Design, Learning and Instructional Technology

Phases of inquiry in practice: Contexts and Variations

Keywords: Assessment Methods, Competencies, Educational Technologies, Gifted and Talented Students, Inquiry Learning, Instructional Design, Mathematics/Numeracy, Science and STEM, Science Education, Secondary Education, Teaching Approaches
Interest group: SIG 20 - Inquiry Learning
Chairperson: ANASTASIOS CHOVARDAS, University of Cyprus, Greece
Organiser: Koen Veermans, University of Turku, Finland
Organiser: Valentina Nachtigall, Ruhr University Bochum, Germany
Discussant: Margus Pedaste, University of Tartu, Estonia

Pedaste et al. (2015) synthesized 32 articles describing inquiry phases or cycles, resulting in a theoretical model on inquiry-based learning. This model has been used in different contexts and leaves considerable room for variations. Our symposium brings some of the different variations and contexts together in order to discuss how this widely cited model has been conceptualized and used. The first paper by Jaakkola focuses on different potential *variations* of the model by reflecting – based on empirical evidence and design examples – on the scope of an inquiry cycle, differentiation within inquiry phases, and the role of scaffolding for inquiry learning. The second and third paper present two different *contexts* for the use of the model. The paper by Trautwein et al. presents how the model from Pedaste et al. has been used in order to develop an instrument for assessing learners' understanding of the scientific inquiry process. Hagenkötter et al. compare the model from Pedaste et al. with a model for mathematical modelling. Based on this comparison and empirical findings, they discuss how the model from Pedaste et al. can be used to refine the model for mathematical modelling. The last paper by Hovardas focuses on one certain *variation* of the model from Pedaste et al., namely the hypothetico-deductive paradigm, and problematizes such a linear conceptualization of inquiry learning. By exploring these different variations and contexts of the model from Pedaste et al., our symposium points to future directions for further investigating and developing a theoretical model on inquiry-based learning.

Problematizing a linear conceptualization of inquiry learning
Presenting Author:ANASTASIOS CHOVARDAS, University of Cyprus, Greece

Inquiry learning in science education and STEM/STEAM has been largely taken to closely resemble scientific practice. The relationship between inquiry learning and the scientific practice, however, has been predominantly marked by a supposedly linear arrangement of tasks according to the hypothetico-deductive paradigm. The main aim of this contribution is to problematize a linear conceptualization of inquiry learning, which needs to go along with challenging a linear conceptualization of the scientific practice itself. Results from two implementations will be presented and discussed, which showcase the inability of the linear conceptualization of inquiry to address several needs of pedagogical design, critical reflection of students through retrospective action, and integration of inquiry learning in learning contexts informed by educational robotics, engineering design education and maker education. Model-based inquiry is much more compatible than linear versions with such learning contexts. It will be proposed to acknowledge the Pedaste et al. (2015) inquiry cycle as a map for diagnosing the proper entry and exit points for student inquiry among multiple options instead of taking the cycle to necessarily denote a unique, linear path.

Mathematical Modelling With Hands-on Experimentation as a Possibility for Inquiry Learning
Presenting Author: Ramona Hagenkötter, Ruhr-University Bochum, Germany; **Co-Author:**Valentina Nachtigall, Ruhr University Bochum, Germany; **Co-Author:**Katrin Rolka, Ruhr University Bochum, Germany; **Co-Author:**Nikol Rummel, Ruhr University Bochum, Germany

Mathematical modelling with hands-on experimentation can be considered as a possibility for inquiry learning in mathematics education as it has many similarities to the phases of inquiry learning described in the model from Pedaste et al. (2015). During mathematical modelling with hands-on experimentation, students deal with a real-world question and conduct a mathematical hands-on experiment to answer it. In doing so, students make assumptions, plan and conduct an experiment, excerpt a mathematical model from the real world, answer mathematical questions within this mathematical model, interpret mathematical results in a real situation, validate the solution and reflect on their approach. However, as part of our quasi-experimental field study, we analyzed the notes of 74 9^{th} and 10^{th} graders working on a mathematical modelling task with hands-on experimentation and found difficulties of students during all steps of mathematical modelling with hands-on experimentation. For example, we observed that students tend to interpret their results in a biased way and, consequently, to falsely confirm their initial assumptions. Based on the model of Pedaste et al. (2015), we, therefore, discuss that Communication and Reflection, which are included in all phases of inquiry learning, should also play a stronger role in all steps of mathematical modelling with hands-on experimentation in order to counteract these difficulties.

Enrichment for talented students: Scientific inquiry competencies in primary schools
Presenting Author: Ulrich Trautwein, University of Tübingen, Germany

The Hector Children's Academy Program (HCAP) is a statewide enrichment program for talented primary school students (grades 1 to 4) with a focus on STEM topics in Baden-Württemberg, one of the largest states in Germany. The so-called Hector Core Courses—courses that are offered by almost all of the 70 local sites—undergo a strict quality assurance process in which their effectiveness is tested with regards to central outcomes in randomized controlled field trials (RCT). Inquiry learning plays a key role in several of these courses. The presentation will provide an insight into the role of scientific inquiry learning within the HCAP. First, we describe the development and validation of a scientific inquiry cycle (SIC) instrument for primary school students. Second, we summarize

findings from several randomized controlled field trials using the instrument to evaluate the effectiveness of a Hector Core Course. Third, we will discuss several important implications for talent research and educational practice, including necessary improvements to the assessment instruments, the need to better understand the association between SIC skills and students' motivational development including a theory of change, as well as the affordances and challenges of modern digital media.

Refining Phases of Inquiry: bridging between model and practice
Presenting Author: Koen Veermans, University of Turku, Finland; **Presenting Author:**Antti Lehtinen, University of Jyvaskyla, Finland; **Co-Author:**Tomi Jaakkola, Tampere University, Finland; **Co-Author:**Wouter Joolingen, Utrecht University, Netherlands

Pedaste et al. (2015) refer to Inquiry-Based Learning as "an educational strategy in which students follow methods and practices similar to those of professional scientists in order to construct knowledge". The aim of the model was to provide a model for inquiry learning in schools that could support the inquiry skills. This presentation discusses three topics in connection to the model: the scope of a cycle, the notion of development of skills and the role of reflection. Development of inquiry skills is closely connected to the need for scaffolding in IBL. Scaffolding is needed to tailor guidance to the learners' needs to the extent that they can accomplish the inquiry processes, but for the development of inquiry skills it is also important to fade scaffolding. The presentation will share examples of how this was translated into fading within the same inquiry cycle through miniature inquiry cycles, and into multiple versions of the same inquiry cycle that differentiate the level of scaffolding. Merits of these approaches, but also the risk over-scaffolding and how that may conceal important aspects of inquiry and decrease reflection and motivation will be discussed based on results of empirical studies and implementations. This will be used to illustrate that one cannot assume that content learning outcomes, inquiry learning outcomes and motivational outcomes are automatically aligned, that reflection be an important factor connected to aligning and that one future direction could therefore be to highlight both the role and place for reflection within the model more explicitly.

Session G 2

23 August 2023 17:00 - 18:30
UOM_CH
Symposium
Instructional Design

Understanding and Optimizing Effects of Retrieval Practice in Education

Keywords: Educational Technologies, Foreign and Second Language Acquisition, Higher Education, Instructional Design, Learning Strategies, Mathematics/Numeracy, Primary Education, Quantitative Methods, Reading
Interest group: SIG 06 - Instructional Design
Chairperson: Niklas Obergassel, Ruhr University Bochum, Germany
Chairperson: Sterre Ruitenburg, Netherlands
Organiser: Gino Camp, Netherlands
Organiser: Julian Roelle, Ruhr University Bochum, Germany
Discussant: Vered Halamish, Bar-Ilan University, Israel

Practicing by retrieving information from memory is highly beneficial for learning. However, although there is consensus on the general effectiveness of retrieval practice, it is not yet fully understood *when* (i.e., under which conditions) retrieval practice works best and *how* (i.e., using which instructional means) its effectiveness can be optimized. Drawing upon four experiments from the field of retrieval practice, the present symposium aims to extend our knowledge regarding these research gaps. Contribution 1 and 2 shed light on the *when* of retrieval practice. Specifically, Contribution 1 examines the effects of retrieval practice (compared to the effects of summarization and restudy) when comprehension versus retention of news-related texts is required. Contribution 2 investigates the role of task complexity and retention interval for the effects of retrieval practice compared to studying worked examples in acquiring problem-solving skills. Contributions 3 and 4 shed light on *how* the effectiveness of retrieval practice can be optimized. Specifically, Contribution 3 examines whether increasing the retrieval effort involved in answering multiple-choice questions (by delaying the display of the answer options) enhances the benefits of retrieval practice in primary education. Contribution 4 investigates whether combining retrieval practice (tasks) with generative learning (tasks) can optimize overall effectiveness of retrieval practice by overcoming the comprehension deficits typically associated with retrieval practice. Taken together, using different theoretical approaches, the symposium will contribute to our understanding of *when* to implement retrieval practice and *how* to optimize its effectiveness. The implications for educational practice will be discussed.

Effects of Retrieval Practice and Summarization on Retention and Comprehension in Primary Education
Presenting Author:fieke ophuis, Open Universiteit, Department of Online Learning and Instruction, Netherlands; **Co-Author:**Leen Catrysse, Open Universiteit, Department of Online Learning and Instruction, Belgium; **Co-Author:**Lucia Rozendal, Open University of the Netherlands, Netherlands; **Co-Author:**Desirée Joosten-ten Brinke, Open University of the Netherlands, Netherlands; **Co-Author:**Gino Camp, Open Universiteit, Department of Online Learning and Instruction, Netherlands

The effects of retrieval practice and summarization on text retention and text comprehension were investigated in an authentic primary school setting. 57 third and fourth grade pupils (M = 9.04 years old, SD = 0.63) read three different news-related texts. In subsequent practice sessions, pupils applied three different learning strategies (retrieval practice, summarization or restudy), one for each text. A final test was administered two weeks after the last practice session. Compared to summarization and restudy, retrieval practice showed a positive effect on the retention of factual knowledge. Additionally, both summarization and restudy provided better text comprehension than retrieval practice, but no difference was found between summarization and restudy. Thus, successful retrieval practice with factual information improves text retention, but appears not to aid text comprehension. Also, using summarization as a practice strategy does not lead to better understanding of the text than simple restudy under authentic learning conditions.

Worked-Examples and Retrieval Practice in Primary School Students' Mathematical Problem-Solving
Presenting Author: Sterre Ruitenburg, Open Universiteit, Department of Online Learning and Instruction, Netherlands; **Co-Author:**Gino Camp, Open Universiteit, Department of Online Learning and Instruction, Netherlands; **Co-Author:**Kevin Ackermans, Open Universiteit, Department of Online Learning and Instruction, Netherlands; **Co-Author:**Paul Kirschner, kirschner-ED / Open Universiteit, Department of Online Learning and Instruction, Netherlands; **Co-Author:**Halszka Maria Jarodzka, Open Universiteit, Department of Online Learning and Instruction, Netherlands

Two practice strategies are generally considered to be effective for acquiring problem-solving skills: worked-examples and retrieval practice. To better understand which strategy works under which conditions, we integrated two existing perspectives into one model. In that model, the optimal practice strategy depends on both the complexity of the learning task and the interval between the final practice opportunity and the test (i.e., retention interval). To test the model, we conducted a multi-classroom experiment with a 2 (Task Complexity: simple vs. complex) x 2 (Practice Strategy: worked-examples vs. retrieval practice) x 2 (Retention Interval: 5 minutes vs. 1 week) between-subjects design (N = 170). We performed a Bayesian 2 x 2 x 2 ANCOVA on participants' problem-solving performance. Although the data provided evidence that prior mathematical knowledge and task complexity affect participants' problem-solving performance, no evidence was found for the hypothesized interaction effects. Further analyses on the effect of practice strategy on problem-solving performance will be presented at the conference.

Benefits of Retrieval Practice with Stepwise Multiple-Choice Questions: A Study in Primary Education
Presenting Author: Gesa van den Broek, Utrecht University, Netherlands; **Co-Author:**Gerard Hoogenhout, Utrecht University, Netherlands; **Co-Author:**Laurie Kist, Utrecht University, Netherlands; **Co-Author:**Liesbeth Kester, Utrecht University, Netherlands; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

Retrieval practice is a powerful tool for learning. One frequent format of retrieval practice is answering multiple-choice questions. However, multiple-choice questions require less retrieval effort than open-ended questions and might therefore be less effective for learning. Recent research shows that stepwise presentation, in which answer options appear after a brief delay, might make multiple-choice questions more effective for retrieval practice: Students can then

(attempt to) retrieve the answer from memory before the answer options are shown. The present classroom experiment aimed to (i) investigate whether stepwise multiple-choice questions are also beneficial for primary school children, and (ii) extend prior research by testing the effectiveness of two different types of stepwise multiple-choice questions (fixed delay and self-paced delay) in comparison to standard multiple-choice questions. Results of the 102 participating students (M_{age} = 10.74) showed that children benefited from stepwise multiple-choice questions. There were no differences between children who received the answer options after a fixed delay or self-paced delay. Furthermore, preliminary analyses suggest that whether students (reported that they) attempted to retrieve the answer from memory before the multiple-choice options became visible, did not moderate benefits of the stepwise display. Overall, findings indicate that the stepwise display of multiple-choice questions is a practical solution to increase children's learning from retrieval practice.

Effects of Combining Retrieval Practice and Generative Learning Tasks
Presenting Author: Niklas Obergassel, Ruhr University Bochum, Germany; **Co-Author:**Alexander Renkl, University of Freiburg, Germany; **Co-Author:**Tino Endres, University of Freiburg, Germany; **Co-Author:**Matthias Nückles, University of Freiburg, Germany; **Co-Author:**Shana Carpenter, Iowa State University, United States; **Co-Author:**Julian Roelle, Ruhr University Bochum, Germany

Engaging learners in retrieval practice tasks is an effective means to promote retention. However, when it comes to fostering comprehension, effects of retrieval practice tasks are often limited. One option to address this issue could lie in combining retrieval practice tasks with generative learning tasks. In contrast to retrieval practice activities, generative learning activities are theorized to predominantly serve the construction of coherent mental representations rather than their consolidation. Hence, by engaging learners in both types of activities, a combination of generative learning tasks and retrieval practice tasks might allow for compensating comprehension deficits typically associated with retrieval practice tasks (analogous to retention deficits typically associated with generative learning tasks). This, in turn, should result in better learning than pure retrieval practice tasks (and pure generative learning tasks). Thus, in the present study we explored benefits of a combination in comparison to pure retrieval practice and generative learning tasks, along with possible differences in effectiveness resulting from different types of sequential combinations. We addressed our research questions by conducting an experiment with university students, using a 5x2-factorial between-subjects-design with *sequence of learning tasks* (generative-learning-only- vs. retrieval-practice-only- vs. generative-learning-first- vs. retrieval-practice-first- vs. restudy-only-sequence) and *posttest timing* (immediate vs. one-week-delayed) as factors. Analyzing a fraction (N = 180) of the foreseen sample (N = 320), we did neither find benefits of a sequential combination nor differences between the two types of combinational sequences. Results based on the full data set will be presented at the conference.

Session G 3

23 August 2023 17:00 - 18:30
AUTH_DC3
Symposium
Teaching and Teacher Education

Teacher competence to see and engage in mathematical thought with their preschoolers

Keywords: Early Childhood Education, Informal Learning, Mathematics/Numeracy, Teacher Efficacy
Interest group: SIG 05 - Learning and Development in Early Childhood
Chairperson: Simone Dunekacke, Freie Universität Berlin, Germany
Organiser: Joke Torbeyns, KU LEUVEN, Belgium
Organiser: Simone Dunekacke, Freie Universität Berlin, Germany
Discussant: Esther Brunner, Switzerland

Preschoolers' mathematical competencies are pivotal for their later academic achievements and can be effectively stimulated in preschool. As preschool instruction mainly involves informal, play-based learning situations, preschool teachers are challenged to see the mathematics in these situations and engage their preschoolers in mathematical interaction and reflection. This symposium brings together four empirical studies on preschool teachers' competencies to provide mathematical learning opportunities in simulated and authentic classroom situations with 1-to-6-year-olds. The symposium is based on the model of competence as a continuum (Blömeke et al., 2015) that distinguishes between dispositions, situation-specific skills (SSS) and performance and is frequently applied in studies on teaching and learning also at the preschool level (e.g., Dunekacke et al., 2012). All four contributions systematically investigate teacher performance and/or underlying dispositions and SSS in preschool mathematics education. The first contribution addresses preschool teachers' questions during picture book reading activities and their associations with teachers' dispositions and SSS. In the second contribution, a new instrument to assess SSS in preschool teacher education is presented. The study in the third contribution focuses on preschool teachers' SSS in the context of picture book reading. In the fourth contribution, the interaction between teachers and preschoolers when sharing a picture book is analyzed. Together, these contributions deepen current insights into preschool teachers' competencies to see the mathematics and offer learning-supportive activities in informal situations. These deepened insights are important for teacher training and professional development initiatives, as will be discussed by Esther Brunner, expert in preschool mathematics teaching and learning.

Preschool teacher competencies when sharing a picture book in view of mathematical development
Presenting Author: Joke Torbeyns, KU Leuven, Belgium; **Co-Author:**Emke Op 't Eynde, KU LEUVEN, Belgium; **Co-Author:**Fien Depaepe, KU Leuven, Belgium; **Co-Author:**Lieven Verschaffel, KU Leuven, Belgium

We studied the number and complexity of the mathematical questions that preschool teachers formulate during shared picture book reading (SPBR) in authentic classroom situations, in association with teachers' dispositions and situation-specific skills (SSS). Departing from the teacher professional competence model of Blömeke et al. (2015), 44 preschool teachers answered four online instruments addressing their mathematical content knowledge (MCK), mathematical pedagogical content knowledge (MPCK), beliefs about the nature of mathematics and teaching and learning mathematics, and mathematical questions proposed during a simulated SPBR activity (SSS). We observed two SPBR activities using picture books written with versus without a mathematical aim in their classrooms. We analyzed the number and abstraction level of the mathematical questions during these SPBR activities, and their associations with teacher dispositions and SSS. For picture books written with as well as without a mathematical aim, we found inter-individual differences in the number of mathematical questions asked, and typically questions at abstraction level 2. Again for both types of picture books, we did not observe any association between (a) teachers' dispositions and SSS and (b) the number and abstraction level of the mathematical questions asked. Although our findings point to teachers' ability to formulate questions that might engage preschoolers in mathematical interaction and reflection during SPBR activities using various types of picture books, future studies are needed to validate and refine our findings taking into account the complex interplay between teacher competencies, child and context variables and actual classroom behavior.

Pre-service EC teacher's situation-specific skills: An insight in quantity and quality
Presenting Author: Simone Dunekacke, Freie Universität Berlin, Germany; **Co-Author:**Lisa Starcke, Freie Universität Berlin, Germany; **Co-Author:**Julia Barenthien, Universität Hamburg, Germany; **Co-Author:**Mirjam Steffensky, Universität Hamburg, Germany; **Co-Author:**Aiso Heinze, Leibniz Institute for Science and Mathematics Education, Germany

Early childhood (EC) teachers' professional competence can be modelled as a multidimensional and domain-specific construct, which includes dispositions, situation-specific skills, and performance. Situation-specific skills are particularly important in preschool contexts where children's domain-specific learning takes place predominantly in everyday situations. The domain-specific assessment of such situation-specific skills is challenging for research on EC teachers. This paper aims to present a new illustration-based instrument to assess two components of situation-specific skills: *perceiving math-related situations* (PERC) and *planning math-related actions* (ACT). The developed test addresses EC teacher's PERC and ACT for different mathematical content areas. It does not only capture the quantity of perceived situations (PERC) and planned actions (ACT) like existing tests, but also the quality of the ACT based on 13 indicators for high and low stimulation quality. First results from a sample of 233 pre-service EC teachers indicate that the test provides a reliable measure for PERC. The findings

are comparable to those from former studies. For ACT, the EC teachers showed a higher number of planned actions compared to the existing research. The distribution of the stimulation quality indicators for ACT was quite heterogeneous. Especially, for the stimulation of reflections in the situation, the EC teachers reached a high quality.

Early childhood teachers' competence to identify mathematics in picture books
Presenting Author: Iliada Elia, University of Cyprus, Cyprus; **Co-Author:**Van den Heuvel-Panhuizen Van den Heuvel-Panhuizen, Utrecht University, Netherlands & Nord University, Norway, Norway; **Co-Author:**Eleni Deliyianni, Cyprus Ministry of Education, Sports and Youth, Cyprus

Several studies have provided evidence for the significant contribution of picture book reading in stimulating children's mathematical thinking and development. However, the role of the teachers when using picture books to support children's learning in mathematics has received limited research attention. As a first step to address this gap, in this study we focused on investigating early childhood teachers' competence to identify the mathematics in picture books. The participants of the study were 9 early childhood teachers. The teachers were asked to identify the mathematics that can be found in two high literary quality picture books which have not been written for teaching mathematics, by filling in an open questionnaire for each book. Results revealed that teachers were able to see mathematical content in a large part of both picture books. However, identifying mathematical processes in the picture books was extremely rare in their responses, while for a part of the books teachers identified aspects that did not correspond to mathematical content, by giving, for example, story-related responses and teaching-related responses. The mathematical content teachers recognized in the picture books included a wide range of mathematical topics. The implications of these findings are discussed for research and practice regarding teachers' competences in using picture books in early mathematics.

Teachers' performance and toddlers' numerical learning opportunities when reading picture books
Presenting Author: Camilla Björklund, University of Gothenburg, Sweden; **Co-Author:**Hanna Palmér, Linnaeus University, Sweden

The aim of this study is to deepen the understanding of how to teach numeracy when reading picture books. The specific research question is: What mathematical learning becomes possible based on teacher performance when reading a picture book designed for numerical learning purposes? Seventy-three video documentations of reading sessions over the course of three semesters were analyzed. The results indicate that how one and the same picture is handled by the teacher impact what the children are afforded to learn. In particular, it seems to make a difference if one or two pages are shown at the same time: one page merely inducing focus on composition of a set, while two pages shown simultaneously open up for exploring differences in quantities, and part-whole relations within sets. This contributes to our understanding of the importance of teacher performance when reading picture books with pedagogical purpose.

Session G 4

23 August 2023 17:00 - 18:30
UOM_A02
Symposium
Cognitive Science, Higher Education, Motivational, Social and Affective Processes

The emergence of creativity within and between individuals and its educational implications

Keywords: Attitudes and Beliefs, Cognitive Skills and Processes, Creativity/Divergent Thinking, Early Childhood Education, Engagement, Metacognition, Peer Interaction, Problem Solving, Self-efficacy, Social Interaction
Interest group: SIG 04 - Higher Education, SIG 10 - Social Interaction in Learning and Instruction, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Evelyn Kroesbergen, Radboud University, Netherlands
Organiser: Honghong Bai, China
Organiser: Kim van Broekhoven, Erasmus University Rotterdam, Netherlands
Discussant: Mare van Hooijdonk, Radboud University Nijmegen, Netherlands

Across the world, there is a broad call for fostering students' creativity in all levels of education, ranging from kindergarten education to tertiary education. But how can teachers foster students' creativity in an effective and adaptive manner? We believe an important starting point is to understand how creativity actually emerges, as only then, teachers will be flexible and precise in setting goals and designing instructions in the classroom. The traditional view regards creativity as an individuals' ability to create products or ideas that are novel and useful (Runco & Jaeger, 2012). However, recent research increasingly points out that creativity is dynamic and situated in nature (Kupers et al, 2019; Glaveanu, 2020). Following this new development, creativity is not viewed as a static, individual trait, but rather, it emerges from the interactions of different cognitive processes within individuals and from the interactions between individuals and the external social and physical environment. Yet, there is a lack of empirical evidence that helps teachers gain insight into the dynamic and situated aspects of creativity, leaving the question "How does creativity emerge within and between students?" largely unanswered. To answer this question, this symposium will bring together four presentations that either focus on creativity of kindergarteners when they interact with adults (Presentation 1), creativity of students when they interact with peers (Presentation 2-3), and the process of creativity within students (Presentation 4). Next, this symposium aims to wonder and articulate how our findings could support future education in fostering students' creativity.

Creativity in dialogues: Parents vs. strangers, who can better support idea generation in children?
Presenting Author: Honghong Bai, Tsinghua University, China; **Co-Author:**Luk Shu Chan, Faculty of Education, University of Hong Kong, Hong Kong; **Co-Author:**Hetao Zhang, School of Education and Information Studies, University of California, United States; **Co-Author:**Li Shang, School of Education and Information Studies, University of California, United States; **Co-Author:**Stella Christie, Tsinghua University, China

Researchers increasingly point out that creativity does not occur in isolation within individual minds but rather through continuous interactions between the person and the environment including the social environment. This study investigated whether and how the interactions that revealed perspective taking within dyads facilitate children's creativity. A group of Chinese children aged 4 to 6 years of age were assigned to two experimental conditions. In the child-parent condition, children worked with a (grand)parent on a known idea generation task—the Alternative Uses Task (AUT). And in the child-stranger condition, children performed the AUT with an unfamiliar university student. Analyses results showed that children interacted slightly more with their parents than with strangers, but children from child-parent dyads did not perform better on the AUT than children from child-stranger dyads. In general, strangers or parents, when they displayed more high-level perspective taking behaviors, thus more often taking in and expanding children's ideas, children could generate more ideas (increasing also the chance of generating more original ideas). But when children more often took in and expanded adult-partners' ideas, although they may generate more ideas, the originality of their ideas decreased. These findings suggest that, when aiming to foster children's (expression of) creativity, adults should try to expand and revise children's ideas and integrate their own, new inputs with that of children's.

Types of talk in student teams: Enabling or stifling creative synergy in teams?
Presenting Author: Kim van Broekhoven, Erasmus University Rotterdam, Netherlands; **Co-Author:**Evelyn Kroesbergen, Radboud University, Netherlands; **Co-Author:**Ming Ming Chiu, Department of Educational Studies, Purdue University, Hong Kong

Worldwide, policy makers call for creativity in higher education to tackle increasingly complex problems. Students working in teams should learn to collaboratively develop creative ideas. Yet, little is understood how certain types of talk in team dialogue enable or stifle creative synergy in teams. Using Mercer's classification of "cumulative", "disputational" and "exploratory" in types of talk, this study examines how patterns in types of talk (e.g., disagree, objecting the idea, clarifying the idea, approving) affect the likelihood of (i) original and (ii) useful ideas in teams. For this, we have conducted statistical discourse analysis on 3.816 turns of talk by 12 students in 4 teams working on an open-ended task in the classroom. Results showed that patterns in types of talk - characterized by cumulative talk – enhances the likelihood of the development of creative ideas, while patterns in types of talk - characterized by exploratory talk – reduces the likelihood of the development of creative ideas but enhances the likelihood of the development of more useful ideas in succeeding turns. These findings suggest that criticism on each other's ideas may stifle creativity synergy in the classroom, but simultaneously, a critical voice may be essential once students start developing more appropriate and useful solutions. Implications and directions for future research are discussed.

The effect of reflective debriefs on team behavior during creative problem solving
Presenting Author: Roni Reiter-Palmon, University of Nebraska, United States; **Co-Author:**Payge Japp, University of Nebraska at Omaha, United States; **Co-Author:**Kyle Christensen, Clemson University, United States; **Co-Author:**Marissa Shuffler, Clemson University, United States; **Co-Author:**A Patel, University of Texas, Dallas, United States; **Co-Author:**Joshua Summers, University of Texas, Dallas, United States

Team reflexivity as a team process does not happen naturally in many cases. Early research on team reflexivity has indicated that the degree to which teams engage in the process is a predictor of team creative performance. Given that team reflexivity may not occur spontaneously and its importance for team outcomes is paramount, an important question emerges: How can team reflexivity be facilitated? In this study we discuss one approach to facilitate team reflexivity and its effect on team creative problem solving. In addition, we will discuss how this intervention influences dynamic team behavior over time, and its effect of team creative performance.

Everyday dynamics of students' creative engagement
Presenting Author: Maciej Karwowski, University of Wroclaw, Poland; **Co-Author:**Aleksandra Zielińska, University of Wrocław, Poland

Is it possible to strengthen students' engagement in creative activities using simple everyday tasks focused on creative thinking, self-efficacy, or valuing creativity? This talk explores this question by summarizing the findings from two intensive, daily-diary studies on university students. In Study 1, during eight days, students (N = 80; 935 student-day units) were faced with simple tasks that required them to focus on creativity for a few minutes, while no prompts were presented during the remaining eight days. Using multilevel modeling, we demonstrated that days with prompts were associated with higher emotional engagement (both positive and negative) and greater creative activity than those without prompts. Specifically, students felt more creative and engaged more intensively in everyday creative activities, yet this effect did not transfer to more domain-specific creativity in science, programming, or design. In a more extensive Study 2 (N = 279 students, 5990 student-day units), we found that motivation-oriented tasks resulted in a higher creative self-efficacy and more intense everyday creative activity compared to more typical, cognitive creative-training-like tasks. These findings open an avenue for developing brief interventions to make creativity more salient in school, work, and family.

Session G 5

23 August 2023 17:00 - 18:30
UOM_A03
Symposium
Learning and Instructional Technology, Motivational, Social and Affective Processes

Advancing SRL research with Artificial Intelligence – theoretical and conceptual foundations

Keywords: Artificial Intelligence, Assessment Methods, Computer-assisted Learning, Computer-supported Collaborative Learning, Emotion and Affect, Metacognition, Mixed-method Research, Self-regulated Learning and Behaviour
Interest group: SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Sanna Järvelä, University of Oulu, Finland
Organiser: Sanna Järvelä, University of Oulu, Finland
Organiser: Inge Molenaar, Radboud University Nijmegen, Netherlands
Discussant: Marcus Specht, TU Delft, Netherlands

The aim of this symposium is to discuss theoretical and conceptual foundations to advance self-regulated learning (SRL) research with Artificial Intelligence (AI). We review our recent research progress and support our claims with empirical research. Measuring SRL has been a major challenge in the learning sciences field. Recently, research has recognized the potential of analyzing multichannel data about SRL with intelligent learning technologies (Järvelä & Bannert, 2021). Advancement in artificial intelligence (AI) has brought novel opportunities to enable sophisticated analysis of different types of data to gain new insights into the learning processes and SRL (Molenaar, 2022; Nguyen et al. 2022) Specifically, interdisciplinary efforts with strong theory-based understanding on SRL could make learning technologies more intelligent by providing real-time SRL support (Azevedo & Gašević, 2019). However, analyses of multichannel SRL process data face several challenges that are associated with the alignment between theoretical notions, data structures, and methodological assumptions that underlie AI techniques used to analyse the data. Research progress is needed in theory and methods to support evidence-based view on the role of AI in SRL research. The four teams will share their current theoretical and conceptual advancement and related empirical evidence and the discussant will raise the critical issues in that progress.

Research on the grid: measuring self-regulated learning with multimodal data and the role of AI
Presenting Author: Susanne de Mooij, Radboud University, Netherlands; **Co-Author:**Joni Lämsä, University of Oulu, Finland; **Co-Author:**Roger Azevedo, University of Central Florida, United States; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany; **Co-Author:**Dragan Gasevic, Monash University, Australia; **Co-Author:**Sanna Järvelä, University of Oulu, Finland; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands

Learning sciences are embracing the significant role AI can play to better detect, diagnose, and act upon self-regulated learning (SRL). The field of SRL is challenged to advance our understanding of how multimodal data can unobtrusively capture the temporality, sequence, and order of learners' cognitive, metacognitive, affective, and motivational states. We conducted a systematic literature review to map empirical research on this topic in a visual grid, which is called the self-regulated learning processes, multimodal data, and analysis (SMA) grid. In our presentation, we use this two-dimensional grid of SRL processes and multimodal data to position the research done so far to visualise the relations and possible combinations between the data streams and the measurement of SRL processes. Moreover, we define analytical approaches in the grid (unimodal, horizontal, vertical, and integrated approaches) to discuss our understanding of the interactions between the axes so far and how AI is applied to investigate these interactions. The methodological results show that there is a historic development in measuring SRL from a unimodal approach with simple statistical analyses to using multimodal data to capture temporal and sequential characteristics of SRL processes. The increasing role of AI in these various advanced data analytic techniques to assess the full complexity of SRL is also discussed.

Towards Hybrid Human-AI Regulation: Supporting Young learners' Self-regulated Learning
Presenting Author: Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Anne Horvers, Radboud University, Netherlands; **Co-Author:**Rick Dijkstra, Radboud University Nijmegen, Netherlands; **Co-Author:**Rianne Kooi, Radboud University Nijmegen, Netherlands; **Co-Author:**Carolien A. N. Knoop-van Campen, Radboud University Nijmegen, Netherlands

Education is a unique area for application of artificial intelligence (AI). Hybrid systems combining artificial and human intelligence hold great promise for training human skills. Hybrid Human-AI Regulation (HHAIR) is a novel way to develop learners' Self-Regulated Learning (SRL) skills within Adaptive Learning Technologies (ALTs). In this contribution, I discuss the first research results of such a system. HHAIR targets young learners (10-14 years) for whom SRL skills are critical in today's society. Many of these learners use ALTs to learn mathematics and languages every day in school. ALTs optimize learning based on learners' performance data but even the most sophisticated ALTs fail to support SRL. In fact, most ALTs take over (offload) control and monitoring from learners. Grounded in the COPES model of SRL and based on empirical studies, this contribution describes how HHAIR can resolve this issue. HHAIR positions hybrid regulation as a collaborative task of the learner and the AI which is gradually transferred from AI-regulation to self-regulation. Learners will increasingly regulate their own learning progressing through different degrees of hybrid regulation. In this way HHAIR supports optimized learning and the transfer and development of SRL skills for lifelong learning (future learning). The HHAIR concept is novel in proposing a hybrid intelligence approach training human SRL skills with AI. This contribution outlines the theoretical and empirical foundations and the research results of the HHAIR system to train SRL skills with AI.

Studying and developing metrics for socially shared regulation in learning
Presenting Author: Sanna Järvelä, University of Oulu, Finland; **Co-Author:**Andy (Khanh Xuan) Nguyen, University of Oulu, Finland; **Co-Author:**Márta

Sobocinski, University of Oulu, Finland; **Co-Author:**Eija Vuorenmaa, University of Oulu, Finland, Finland; **Co-Author:**Ahsen Çini, University of Oulu, Finland

While the benefits of regulated learning for effective collaborative learning are evidenced, little is known about the events that determine regulation. We have introduced the trigger concept framework whereby we will be able to detect adaptive/maladaptive socially shared regulation processes involving regulatory responses. This study aims to investigate, test and evidence our trigger concept framework with multimodal data and AI-based methods. We designed experimental and control study among high school students (N= 87) with manipulated challenge events in collaborative learning tasks for answering the main research question: What are the triggers of cognitive and emotional regulation in CL? The results of this study will advance current understanding in metrics of regulation in collaborative learning and contributes to understanding how various data can be used for developing AI-enabled real-time support for regulation in collaborative learning.

Closing the feedback loop for self-regulated learning with learning analytics
Presenting Author: Mladen Raković, Monash University, Australia; **Co-Author:**Yizhou Fan, Peking University, China; **Co-Author:**Tongguang Li, Monash University, Australia; **Co-Author:**Shaveen Singh, Monash University, Australia; **Co-Author:**Xinyu Li, Monash University, Australia; **Co-Author:**Dragan Gasevic, Monash University, Australia

Although development of self-regulated learning (SRL) skills is commonly considered important for students to become productive life-long learners, many students find this task challenging. They often need external feedback to advance their SRL. To provide appropriate feedback on student SRL, it is critical to validly measure SRL processes that students enacted, identify processes that benefit/harm learning and performance, and, based on that, tailor feedback to help them alter their SRL behaviours in a productive way. Following recent advancements in the field, learning analytics methods for collecting and analysing student trace data can be utilised in closing the feedback loop for SRL. In particular, these methods can aid understanding of SRL processes as they dynamically unfold during the learning task and provide automated and personalised scaffolding of SRL. We propose a conceptual framework describing how the feedback loop for self-regulated learning may be closed with learning analytics. Our framework is motivated by the three-stage approach to learning analytics adoption (Authors, 1) and includes the following stages: gathering trace data that describe SRL processes (i.e., data stage), generating analytics of SRL (i.e., model stage) and tailoring analytics-based scaffolds of SRL to students (i.e., transformation stage). We describe each of these stages in the context of SRL and list several challenges for future research.

Session G 6

23 August 2023 17:00 - 18:30
AUTH_DC1
Symposium
Assessment and Evaluation, Learning and Social Interaction

Investigating students' active participation in classroom discourse

Keywords: Artificial Intelligence, Assessment Methods, Classroom Assessment, Dialogic Pedagogy, Engagement, Motivation, Social Aspects of Learning and Teaching, Social Interaction, Teacher Professional Development
Interest group: SIG 01 - Assessment and Evaluation, SIG 10 - Social Interaction in Learning and Instruction
Chairperson: Ricardo Böheim, Technical University of Munich, Germany
Organiser: Ricardo Böheim, Technical University of Munich, Germany
Discussant: Maria Vrikki, University of Nicosia, Cyprus

Students' active participation in classrooms is considered to be crucial for student learning. During classroom discourse, students are commonly expected to exchange ideas and to co-construct knowledge by building on each other's contributions. However, research highlights that students' active participation varies significantly among individuals, as some are very active while others are quite reluctant to participate at all. The extent to which students are actively involved in classroom discourse is usually conceptualized through observable indicators such as hand raising or verbal engagement. This symposium presents three empirical studies that provide new insights into central antecedents and outcomes of students' active participation in classroom discourse. An additional methodological contribution presents recent advances in the automated coding of student participation. The first contribution examines whether an intervention on teachers' dialogic discourse can enhance verbal participation and student learning. The second contribution focuses on shy students' hand raising and investigates how contextual and teacher-specific factors are related to their hand raising behavior. The third contribution analyzes the bidirectional nature of the relationships between hand raising and cognitive or motivational student characteristics throughout one school year. Using a machine learning approach, the last contribution presents results on the automated detection of hand raising as a time- and cost-effective method for assessing students' active participation in classrooms. Results from this symposium aim to help educators better support students' active participation as well as highlight the potential of automated methods for student participation data collection in future research.

Can dialogic discourse enhance student participation and student learning?
Presenting Author: Klara Sedova, Masaryk University, Czech Republic; **Co-Author:**Martin Sedlacek, Masaryk University, Czech Republic; **Co-Author:**Roman Švaříček, Masaryk University, Czech Republic; **Co-Author:**Zuzana Salamounova, Masaryk University, Czech Republic; **Co-Author:**Tomáš Lintner, Masaryk University, Czech Republic

Recent educational research strongly focuses on students' active participation in classroom discourse and its potential to enhance student learning. Many intervention studies conducted in the past two decades tried to promote more productive dialogues in everyday classrooms, some of them with remarkable success. However, these studies typically investigate classrooms as analytic units and neglect differences between individual students. In the present study, we designed an intervention that aimed at promoting a collective and dialogic discourse in which all students can participate actively. We conducted a quasi-experimental study. Six classes took part in an intervention group focused on implementing collective dialogue. Before the project and at its end we measured the quantity of students' active participation in classroom discourse. In addition, students completed achievement tests. There were six control classes included in the study who did not participate in the intervention program but completed pre- and post-measurements. Results showed that the intervention was effective in terms of increasing students' active participation in classroom discourse in intervention classes and, at the same time, in decreasing differences in talk time between students. Furthermore, intervention classes outperformed the control classes in the achievement test at the end of the project. Results may encourage teachers to integrate dialogic approaches into their discourse practice to foster students' active participation and to reduce inequalities in students' vocal engagement.

Promoting active participation: Examining contextual factors influencing shy students' hand raising
Presenting Author: Lukas Mundelsee, University of Heidelberg, Germany; **Co-Author:**Susanne Jurkowski, Universität Erfurt, Germany

This field study sought to contribute to a deeper understanding of what promotes the active participation of students, in particular of shy students whose passive silence is thought to pose a risk to their academic adjustment. Data were collected using (1) student self-reports, (2) observations, and (3) behavioral measures of student hand raising of 204 middle-school students during a total of 116 lessons. Multilevel analysis indicate that shy students raise their hands more in the social sciences, the better the student-teacher relationship, the more a teacher uses warm calling, but also the colder the class climate. The findings confirm some previous assumptions, but also raise the question of whether shy students should sometimes be allowed to remain silent as long as they are cognitively and emotionally engaged.

Hand raising and its bidirectional relationships with cognitive elaboration and self-concept
Presenting Author: Ricardo Böheim, Technical University of Munich, Germany; **Co-Author:**Martin Daumiller, University of Augsburg, Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany

Hand raising is a key student behavior in everyday classrooms. Recent studies show that hand raising is related to important learner characteristics. However,

most research on hand raising is limited to correlational interpretations; directional influences among hand raising and learner characteristics over time have not been explored. In the present study, we investigate reciprocal relationships of hand raising with cognitive and motivational learner characteristics. We collected behavioral data on students' hand raising using video-recordings of 376 high school students at the beginning and at the end of the school year. Results show that students' hand-raising behavior is relatively stable throughout the school year. A latent cross-lagged panel analysis revealed bidirectional relationships between hand raising, cognitive elaboration and academic self-concept. Specifically, hand raising functioned as both an antecedent and an outcome of students' cognitive elaboration. In addition, hand raising at the beginning of the school year positively predicted changes in students' academic self-concept. Results suggest that engaging in hand raising seems to create opportunities that provoke positive changes in students' cognitive and competence-related learning experiences.

Automated hand-raising detection in classroom videos
Presenting Author: Babette Bühler, Hector Research Institute of Education Sciences and Psychology, Germany; **Co-Author:**Ruikun Hou, University of Tübingen, Germany; **Co-Author:**Efe Bozkir, University of Tübingen, Germany; **Co-Author:**Patricia Goldberg, University of Tübingen, Germany; **Co-Author:**Peter Gerjets, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Ulrich Trautwein, University of Tübingen, Germany; **Co-Author:**Enkelejda Kasneci, Technical University of Munich, Germany

Hand-raising is an important indicator of students' active participation in classroom discourse, and thus a crucial prerequisite for successful learning. The automated detection of hand-raising events in classroom videos can offer a time and cost-effective substitute for the manual annotation of human observers. Main challenges for the automated detection are diverse camera angles and student occlusions in the classroom setting. In this study, we propose a novel view-invariant, occlusion-robust machine learning approach to hand-raising detection in classroom videos, based on body pose estimation. We employed a dataset stemming from 29 real-world classroom videos, capturing 264 students from grades 5 to 12 and 1916 manually annotated hand-raising events. Our temporal models trained on body pose embeddings achieved a F1 score of 0.701, which is the harmonized mean of precision and recall of hand-raising predictions. The potential of this detection approach to enable future large-scale research on student participation and to allow privacy-preserving data collection in the classroom is discussed.

Session G 7

23 August 2023 17:00 - 18:30
UOM_CR
Symposium
Assessment and Evaluation, Learning and Instructional Technology

Current Reading Research: Covid-19 Impact, Risks and Benefits of Digital Technologies for Reading

Keywords: Achievement, Digital Literacy and Learning, E-learning/ Online Learning, Educational Technologies, Instructional Design, Large-scale Assessment, Mathematics/Numeracy, Pandemic, Primary Education, Reading
Interest group: SIG 01 - Assessment and Evaluation, SIG 02 - Comprehension of Text and Graphics, SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Ulrich Ludewig, Institute for School Development Research, TU Dortmund University, Germany
Discussant: Danielle McNamara, Arizona State University, United States

The COVID-19 pandemic had an impact on education worldwide and triggered a shift to digital learning in many countries. More and more evidence on the pandemic's impact on children's literacy has been gathered lately. These findings help us to better understand the impact of the home literacy environment and digital technology, and not only contribute to the unraveling of the unique pandemic situation. This symposium focuses on elementary students' reading skills and bridges research on the impact of COVID-19 on students' and their home literacy environments, the long-term impact of reading on digital devices versus on paper, and the benefits of educational technologies for literacy instruction. The first contribution looks at the overall impact of reading achievement loss, family background and gender with a representative school panel study of German fourth graders. The second paper focusses on the quantification of learning losses in reading and math of 3rd graders based on longitudinal data from Finland. The third paper investigates the effects of reading frequency, on screen and in print, during reading for leisure and for homework, on the development of reading comprehension skills. The study has a longitudinal design with 4th to 6th graders in Spain. The fourth paper presents a multi-study summary with randomized field trials and observational studies on the literacy instruction applications *Inference Galaxy* and *iSTART-Early* for children between kindergarden and 4th grade. The symposium connects perspectives of representative large-scale studies, in-depth longitudinal analyses and instructional effectiveness research to understand and improve elementary school students' reading ability.

COVID-19 Pandemic and Student Reading Achievement – Findings from a School Panel Study
Presenting Author: Ulrich Ludewig, Institute for School Development Research, TU Dortmund University, Germany; **Co-Author:**Ruben Kleinkorres, Institute for School Development Research, TU Dortmund University, Germany; **Co-Author:**Rahim Schaufelberger, Institute for School Development Research, TU Dortmund University, Germany; **Co-Author:**Theresa Schlitter, Technical University Dortmund, Germany; **Co-Author:**Ramona Lorenz, Institute for School Development Research, TU Dortmund University, Germany; **Co-Author:**Nele McElvany, Institute for School Development Research, TU Dortmund University, Germany

Since 2020, the COVID-19 pandemic had an impact on education worldwide. There is increased discussion of possible negative effects on students' learning outcomes and the need for targeted support. We examined fourth graders' reading achievement based on a school panel study, representative on the student level, with $N = 111$ elementary schools in Germany (total:$N = 4{,}290$ students, age: 9-10 years). The students were tested with the*Progress in International Reading Literacy Study* instruments in 2016 and 2021. The analysis focused on (1) total average differences in reading achievement between 2016 and 2021, (2) average differences controlling for student composition, and (3) changes in achievement gaps between student subgroups (i.e., immigration background, socio-cultural capital, gender). The methodological approach met international standards for the analysis of large-scale assessments (i.e., multiple multi-level imputation, plausible values, clustered mixed-effect regression). The results showed a substantial decline in mean reading achievement. The decline corresponds to one-third of a year of learning, even after controlling for changes in student composition. We found no statistically significant changes of achievement gaps between student subgroups, despite numerical tendencies towards a widening of achievement gaps between students with and without immigration background. It is likely that this achievement decline was related to the COVID-19 pandemic. The findings are discussed in terms of further research needs, practical implications for educating current student cohorts, and educational policy decisions regarding actions in crises such as the COVID-19 pandemic.

Reading and Math Skills Development among Finnish Children before and after COVID-19 School Closure
Presenting Author: Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland; **Co-Author:**Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Jenni Salminen, University of Jyväskylä, Finland; **Co-Author:**Minna Torppa, University of Jyväskylä, Finland

This study quantified the possible learning losses in reading and math skills among a sample of Finnish Grade 3 children ($n = 198$) who spent eight weeks in distance learning during the first wave of the COVID-19 pandemic in spring 2020. We compared their reading and math skill development trajectories across Grades 1, 2, and 4 to a pre-COVID sample ($N = 378$). We also examined if gender, parental education, maternal homework involvement, and child's task-avoidant behavior predict children's academic skills at Grade 4 differently in the pre-COVID sample compared with the COVID sample. Children's reading and math skills were tested, mothers reported their education and homework involvement, and teachers rated children's task-avoidant behavior. The results showed, on average, lower reading skills in the COVID sample than in the pre-COVID sample but there were no differences in math skills. Although the COVID sample had lower levels in reading, their developmental trajectories in reading and math skills were not different from the pre-COVID sample before the pandemic in Grades 1 and 2. From Grade 2 to 4, however, the development was slower in reading fluency and comprehension in the COVID sample, but not in math. The predictors of change from Grade 2 to 4 in reading and math skills were not different in the samples. The results showed that the development of reading skills in particular may have been affected by the COVID-19 pandemic.

Associations Between Reading Habits and Comprehension Skills in Primary School
Presenting Author: Lidia Altamura García, University of Valencia, Spain; **Co-Author:**Ladislao Salmerón, University of Valencia, Spain; **Co-Author:**Mari Carmen Blanco, University of Zaragoza, Spain; **Co-Author:**Pablo Delgado, University of Sevilla, Spain; **Co-Author:**Victoria García, University of Valencia, Spain; **Co-Author:**Amelia Mana, University of Valencia, Spain; **Co-Author:**Sandra Montagud, University of Valencia, Spain; **Co-Author:**Johannes Naumann, University of Wuppertal, Institute for Educational Research, Germany; **Co-Author:**Luis Ramos, University of Valencia, Spain; **Co-Author:**Mario Romero, University of Valencia, Germany; **Co-Author:**Cristina Vargas, University of Valencia, Spain

On-screen reading has been introduced in classrooms across the world faster than our knowledge of its potential effects on reading comprehension. Our study aims to analyze the implications of this phenomenon in primary school classrooms, exploring the relationship between reading frequency, on screen and in print, when students read for leisure or for homework, in the development of reading comprehension skills. Data from 831 4th to 6th grade students revealed small-sized positive relationships for reading frequency for leisure-paper and school-paper, as well as a small-sized negative relationship for school-digital reading. The relationship was not significant for leisure-digital reading. We discuss the results in light of the current debate regarding digitalization of reading in schools, and identify limitations of our work.

The Promise of Educational Technologies in Improving Literacy Instruction and Student Outcomes
Presenting Author: Panayiota Kendeou, University of Minnesota, United States; **Co-Author:**Kristen McMaster, University of Minnesota, United States; **Co-Author:**Danielle McNamara, Arizona State University, United States

Recognizing the promise of educational technologies for literacy instruction, we developed two theory-based tools that promise to improve reading comprehension in elementary school students. *Inference Galaxy* was developed to improve students' inferencing in Kindergarten to Grade 2 and*iSTART-Early* was developed to improve students' use of comprehension strategies, including comprehension monitoring and question asking, paraphrasing, inferencing (prediction, bridging, elaboration), explanation, and summarization in Grades 3-4. In this paper, we present these tools as well as initial evidence for their efficacy in improving proximal and distal reading comprehension outcomes. Overall, results of several studies demonstrate initial promise for both tools in improving students' inferencing and comprehension, and highlight the promise of standardized, individualized delivery of instructional tools in classroom settings.

Session G 8

23 August 2023 17:00 - 18:30
AUTH_DC2
Single Paper
Learning and Social Interaction, Teaching and Teacher Education

Creativity and Divergent Thinking in Education

Keywords: Cognitive Skills and Processes, Conceptual Change, Creativity/Divergent Thinking, Emotion and Affect, Problem Solving, Qualitative Methods, Quantitative Methods, Social Interaction, Student Drawings, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Robbert Smit, University of Teacher Education St.Gallen, Switzerland

Effects of physical, and social environmental factors on creative thinking.
Keywords: Cognitive Skills and Processes, Creativity/Divergent Thinking, Emotion and Affect, Problem Solving
Presenting Author: Kim Ouwehand, Erasmus University Rotterdam, Netherlands; **Co-Author:**Fred Paas, Erasmus University Rotterdam/University of Wollongong, Netherlands

The present study investigated whether environmental physical (open or separated space) and social (feeling included or excluded from the others in a shared space) factors influence creative thinking. All participants (N = 92) were tested in groups of four. Half of the participants were tested in an open space and the other half in a separated space. Within the space conditions participants were further divided into a group with a socially inclusive atmosphere and a group with an exclusive atmosphere. Preliminary results showed that convergent thinking is enhanced in a separated compared to an open space. Interestingly, for divergent thinking the inclusion group benefited from an open compared to a closed space, while in the social exclusion condition, this pattern was reversed. These outcomes are of direct importance to learners and educators and can provide guidelines on how to design learning environments and stimulate a positive social climate for optimal performance.

Sketchnoting - visual notetaking for creative thinking and learning from educational science text
Keywords: Creativity/Divergent Thinking, Emotion and Affect, Student Drawings, Teaching/Instructional Strategies
Presenting Author: Laura Ohmes, Carl von Ossietzky University Oldenburg, Germany

Sketchnoting is a note taking strategy for summarizing complex information not only by writing, but also by constructing diagrammatic structures, simple sketches and visual metaphors (Rohde, 2013). Drawing on models about cognitive and affective processes in creative and self-regulated learning, the aim of this study was to investigate the benefits and costs of sketchnoting for learning from educational science text and creative learning in teacher education. Ten student teachers (90 % female) participated in stimulated recall interviews, in which they reported their thoughts and experiences based on a video stimulus which showed their sketchnoting. Preliminary findings indicate, that sketchnoting helped the students to better understand the text and that sketchnoting implies and enables creative learning processes (e.g., *analysis*, *synthesis*, and the development of ideas for visual representations including *fluency*, *flexibility* and *originality*) which occur in bottom up and top down self-regulation processes. While sketchnoting, students experienced various emotions and metacognitive feelings (e.g., joy and a feeling of satisfaction vs. confusion and feelings of difficulty) whereas unpleasant emotions and feelings led to modifications in the sketchnoting process (e.g., feeling of insecurity led to the adjustment of drawings). Difficulties in the sketchnoting process were due to various reasons, including identifying key points in the complex text. In conclusion, the findings point to the connection between self-regulated and creative learning in sketchnoting. They suggest that sketchnoting supports learning from science text and provides an opportunity for creative learning in teacher education. However, teachers should be aware of students´ difficulties to provide appropriate support.

Patterns of creativity in teacher-student interactions in the context of elementary science lessons
Keywords: Creativity/Divergent Thinking, Quantitative Methods, Social Interaction, Teaching/Instructional Strategies
Presenting Author: Elisa Kupers, University of Groningen, Netherlands; **Presenting Author:**Astrid Menninga, University of Groningen, Netherlands; **Co-Author:**Marijn Van Dijk, University of Groningen, Netherlands

How can teachers best facilitate students' creativity in their lessons? The way educational research has tried to answer this question depends on how creativity is conceptualized: as a personal characteristic or as a process that unfolds in interaction between students, peers, and teachers in the classroom. In this study, we took the latter approach and studied how two important elements of creativity, novelty and appropriateness, emerge in joint discussion and action of teachers and students during pre-school and early elementary science lessons. Seven experienced, and seven novice teachers participated with 3-6 students (4-6 years old) per teacher. Video recordings of the science lessons were coded from moment to moment on two dimensions: the degree of novelty and appropriateness of each student utterance, and the type of teacher instruction (aimed at divergent or convergent thinking). With lag sequential analyses and permutation tests, we explored patterns in teacher behavior and student creativity. Results showed that student utterances with a high degree of novelty were relatively rare. Likewise, teachers' behaviors were more aimed at convergent, than at divergent thinking. The sequential analyses showed significant (p

Creativity in education – an explorative study on student teachers´ concepts of creativity
Keywords: Conceptual Change, Creativity/Divergent Thinking, Qualitative Methods, Teacher Professional Development
Presenting Author: Laura Ohmes, Carl von Ossietzky University Oldenburg, Germany; **Co-Author:**Lena Haug, Carl von Ossietzky University Oldenburg, Germany; **Co-Author:**Uta Wagener-Praed, University of Oldenburg, Germany; **Co-Author:**Juliane Schlesier, Carl von Ossietzky University Oldenburg,

Germany; **Co-Author:**Gerd Hoffmann, C.v.O. Universität Oldenburg, Germany; **Co-Author:**Barbara Moschner, Carl von Ossietzky Universität Oldenburg, Germany

The implementation and facilitation of creativity in schools is a highly relevant, but challenging task of 21st century education (Vincent-Lancrin et al., 2019). In the scientific literature, creativity is often associated with originality and effectiveness which can be promoted by an environment that provides self-determination and a certain degree of structure. The current study aims to investigate student teachers' concepts of creativity. A hundred and forty one student teachers (71.42% female; M_{age} = 22.52 years, SD = 3.40) responded to an open question on their definition of creativity which was part of a qualitative online questionnaire. The data was analysed using content analysis.Preliminary results suggest, that student teachers´ concepts of creativity are about creating something new and original (material or immaterial, e.g., ideas) which does not have to be necessarily useful. Creativity is also described as an individual process which implies the development and modification of ideas as well as the expression of individual feelings, thoughts and perceptions. The students emphasize individuality, freedom and the absence of restrictions with regard to creativity, but refer less explicitly to supportive structured environments and cooperation. The results are discussed in the context of scientific concepts of creativity and self-determination theory. Teacher trainings should highlight the relevance of structured environments for creative thinking and production as well as the importance of cooperation for creativity.

Session G 9

23 August 2023 17:00 - 18:30
UOM_R09
Single Paper
Learning and Instructional Technology, Learning and Social Interaction, Teaching and Teacher Education

Play, Learning and Development

Keywords: Competencies, Creativity/Divergent Thinking, Cultural Diversity in School, Early Childhood Education, Educational Technologies, Emotion and Affect, Game-based Learning, Higher Education, Learning Approaches, Peer Interaction, Pre-service Teachers, Problem Solving, Qualitative Methods, Social Interaction
Interest group: SIG 26 - Argumentation, Dialogue and Reasoning, SIG 28 - Play, Learning and Development
Chairperson: Kalypso Iordanou, University of Central Lancashire, Cyprus

The Children`s perspective of play in pre-primary and primary school settings in Finland
Keywords: Creativity/Divergent Thinking, Cultural Diversity in School, Learning Approaches, Peer Interaction
Presenting Author: Taina Kyrönlampi, University Oulu, Finland; **Co-Author:**Riikka Sirkko, University of Oulu, Finland

In Finland, children start pre-primary education when they are six years old. After one year, they move to the first grade of primary school. Although the operating environments of pre-primary education and direct education efforts have been made to harmonize, children experience a distinctive change in their social relationships and physiological space when they enter first grade. In this research, we are interested how children's experiences in their play differ in the pre-primary and primary school contexts. This study explores "play-activity" in photographs initially taken by the children in their primary and preprimary school activities. The research data consist of 13 children's (aged 6) photographs and group discussions in which the children viewed the photographs with the researcher. The second research data consists of 16 children`s (old 7: first grade) photographs and the group discussion with the research on their school experiences. In this study, we used a phenomenological approach (Giorgi 1994). The phenomenological theory describes how the world is experienced by individuals (Merleau- Ponty 1988.)Preliminary research results show that recess at school and indoor and outdoor play moments at preprimary school and primary school are important moments for children. In addition, it is essential for children's experiences that they can use nature's diversity as part of the play.

Students' decision-making during playing educational games
Keywords: Game-based Learning, Learning Approaches, Problem Solving, Social Interaction
Presenting Author: Fredrik Rusk, Åbo Akademi University, Finland; **Co-Author:**Senja Celius, Nord University, Norway; **Co-Author:**Wenche Rønning, Nord Universitet, Norway

The current research paper focuses on analysis of video recordings of students playing a card game about fractions. The analysis focuses on the students' social interactions and decision-making. The results indicate that decision-making and negotiation are not straightforward practices when students are playing games. Based on different situations when students make decisions when playing the fraction game, they express their knowledge and assumptions regarding who has the bigger fraction, and hence affect the decision-making process. Focus is on describing and exemplifying how students organize their social interaction as they make decisions. When studying the situations closely we find recurring patterns regarding how students express their knowledge and how decisions are made when playing the card game. For negotiations to start, there needs to be some tension or disagreement about the decision. When there is disagreement students either express explanations and strategies about how they think, or they make use of available learning resources. When explanations are not accepted by the other student, the turn to the learning resources to settle the disagreement. Also, finding indicate that preconceived epistemic status does not seem to influence students' ability to express disagreement and take the initiative to make a decision.

Pre-service teachers' playfulness and its connections to the working life
Keywords: Early Childhood Education, Emotion and Affect, Higher Education, Pre-service Teachers
Presenting Author: Signe Pirkko Siklander, University of Oulu, Finland, Finland; **Co-Author:**Marjaana Kangas, University of Lapland, Finland; **Co-Author:**Tarja-Riitta Hurme, University of Turku, Finland; **Co-Author:**Anitta Melasalmi, University of Turku, Finland

Playfulness is a requisite for designing and realizing playful child-centred methods in the early childhood education (ECE) contexts. Playfulness is useful also in interaction with colleagues and caregivers and it has potential to bring hope. It is assumed that ECE teachers naturally bring playfulness into the daily practices. Despite of the vast amount of playfulness studies, ECE teachers nor the ECE teacher education have not gained scientific interest. The aim of this mixed method research is to explore pre-service teachers' playfulness, particularly in the area of ECE. Following research questions were set: 1) How playful do the pre-service ECE teachers view themselves, and what are the main qualities connected with their playfulness? and 2) How pre-service teachers' agency relates to the playfulness in the context of working life? Quantitative analysis and qualitative abductive content analysis resulted findings: teacher's playfulness-connected pedagogical actions are teacher-initiated, child-centered and community-related with shared agency. Pre-service teachers' cautiousness prevents their playfulness and adaptivity. The results are useful in designing ECE education. In addition, results bring new knowledge about playfulness in the ECE domain. The findings will be discussed from the theoretical perspectives including the relations of agency, cautiousness and playfulness, and practical pedagogical usefulness.

The impact of esports on the youth from a human capital perspective: A systematic review
Keywords: Competencies, Educational Technologies, Game-based Learning, Qualitative Methods
Presenting Author: Samuel Kai Wah Chu, The University of Hong Kong, Hong Kong; **Co-Author:**Chenguang Du, Tangshan Normal University, China; **Co-Author:**Kevin Conn, California State University Northridge, United States; **Co-Author:**Qi Zhang, Dalian University of Finance And Economics, China

Esports have picked up steam among adolescents and young adults over the last decade. Participation in esports is believed to have widespread negative consequences for a young person's health but positive effects on skill development. However, there are no systematic reviews that clarify and consolidate esports impact, and we presently lack a comprehensive understanding of esports on which to construct educational applications. This paper intends to undertake a systematic literature review on the influence of esports on young people from the perspective of human capital, which is a vital task in education for individual and social development. The findings indicate that esports can positively influence knowledge, skills, and abilities required in the 21st century but have positive and negative health implications. Although esports is associated with unhealthy diets and sleep problems, the sedentary nature does not contribute to a

decline in physical activity. Esports has been linked to mental health disorders like gaming disorder and problem gambling but can generate positive attitudes, including self-directedness. Based on the findings, the article proposes the potential of esports-based learning techniques to accumulate human capital and facilitate educational transformation. This review not only contributes to redefining human capital by addressing health issues and sheds light on the novelty of considering esports in the human capital accumulation process. Identifying the impact of esports has implications for designing esports-based learning programs in both formal and informal learning contexts and for reforming game-based learning and serious games to enhance educational effectiveness.

Session G 10

23 August 2023 17:00 - 18:30
UOM_A10
Single Paper
Learning and Social Interaction, Teaching and Teacher Education

Teacher Biases

Keywords: Bilingual Education, Early Childhood Education, In-service Teachers, Metacognition, Misconceptions, Pre-service Teachers, Quantitative Methods, Reading, Science Education, Self-regulated Learning and Behaviour, Social Interaction
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 16 - Metacognition and Self-Regulated Learning, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Susanne Narciss, TU Dresden, Germany

Debiasing (student) teachers' anchoring effects to support appropriate interpretations of evidence?
Keywords: In-service Teachers, Misconceptions, Quantitative Methods, Science Education
Presenting Author: Kristina Bohrer, University of Education Karlsruhe, Germany; **Co-Author:**Kirstin Schmidt, University of Education Karlsruhe, Germany; **Co-Author:**Samuel Merk, PH Karlsruhe, Germany

Since evidence-informed educational practice implies, for example, advantages for development and a beneficial handling of challenging situations, teachers are encouraged to engage with such evidence. This is impeded by various barriers, which include cognitive biases such as the anchoring effect, according to which numerical estimates are aligned with an already known standard for comparison. In the context of education, this anchoring effect has rarely been studied. Hence, we examined in a randomized controlled trial anchoring effects on student teachers' interpretation of scientific evidence (N = 233). Participants were presented with two study reports and were asked to rate the appropriateness of the sample sizes. We assumed that the sample size of the first study report acts as an anchor for the appropriateness rating of the sample size in the second report. Bayes factors showed strong evidence for large anchoring effects in the appropriateness rating of sample sizes (d = 2.97 , BF10 > 100). Because of the operationalization of the anchoring effect as an interpretation rather than a mere numerical estimation, we hypothesize that the appropriateness rating in study one is a matter of mediation. Regarding this, we are planning a second study that examines this mediation effect and thus reveals how to debias the anchoring effect in (student) teachers' interpretation of scientific evidence. The results will allow us to give recommendations for the communication of scientific study results that enable the successful engagement with evidence despite the ubiquitous anchoring effect.

Learning From Texts: Effects of Instructions on Preservice Teachers' Judgment Biases
Keywords: Metacognition, Pre-service Teachers, Reading, Self-regulated Learning and Behaviour
Presenting Author: Sabine Schlag, University of Wuppertal, Germany; **Co-Author:**Jennifer Knellesen, Bergische University of Wuppertal, Germany

Student's ability to judge his or her comprehension is essential to successful learning from texts. In general, students are overconfident about their comprehension. Overconfidence can result from mismatches between cues used to judge comprehension and future test requirements. In this study, students were given instructions that provided them with information about how the future test will look, thereby reducing misalignment and overconfidence. 171 pre-service teacher students received one of three instructions (none – memory test – application test) and read one of two texts, judged their overall comprehension and answered both memory test (recognition task) and application test questions (transfer tasks). Results for one of the two texts have shown that (1) students who received memory instruction or no instruction were underconfident about their memory performance, while students who received application instruction showed no tendency towards over- or underestimation, (2) students who received application instruction showed less overestimation of their application performance than students in the memory instruction and control groups. For the other text results showed that students were – for all three instructions - (3) underconfident about their memory performance and (4) neither under- nor overestimated their application performance. In conclusion, our results showed that an application instruction - at least for one of the two texts - can help students to reduce overconfidence regarding their application performance.

Dual Language Use as a Resource in Word Explanations During Shared Reading
Keywords: Bilingual Education, Early Childhood Education, Reading, Social Interaction
Presenting Author: Dilman Nomat, University of Oslo, Norway; **Co-Author:**Vibeke Grøver, University of Oslo, Norway; **Co-Author:**Veslemøy Rydland, University of Oslo, Norway

In the present study, we report on the home component of a larger shared reading intervention in Norway that primarily targeted preschools (Authors, 2020). Bilingual families were invited to participate in a study on how preschools and parents could work together to support children's bilingual development. As part of the intervention, the preschools and parents received the same children's picture books to read together with the children. Most of these were wordless books that built a narrative through pictures only. We examined the transcribed audio-tapes of 151 bilingual parent-child dyads who shared the same book at home to better understand the characteristics of parents' *labelling* and *word explanations* during this literacy activity. Dyads came from 11 language minority groups, and children's ages ranged from three to five years. While bilinguals naturally alternate between their languages (i.e., code-switch) when communicating, we sought to examine the role of parents' code-switching when labelling and explaining words to their children during shared reading. The results indicated that parents code-switched more frequently when explaining the meaning of words compared to labelling words. These findings suggest that parents' alternation between their first and second languages serves as a resource that helps them explain words to their children during shared reading.

Session G 11

23 August 2023 17:00 - 18:30
UOM_A13
Single Paper
Instructional Design, Teaching and Teacher Education

Writing: Metalinguistic Processes and Interventions

Keywords: Cognitive Skills and Processes, Computer-assisted Learning, Dialogic Pedagogy, Digital Literacy and Learning, Engineering Education, Feedback, Foreign and Second Language Acquisition, Higher Education, Instructional Design, Metacognition, Qualitative Methods, Teaching Approaches, Writing/Literacy
Interest group: SIG 11 - Teaching and Teacher Education, SIG 12 - Writing
Chairperson: Megan Wiedbusch, University of Central Florida, United States

Student Writers' Metalinguistic Understanding of Transitions in Written Argument
Keywords: Foreign and Second Language Acquisition, Higher Education, Metacognition, Writing/Literacy
Presenting Author: Debra Myhill, University of Exeter, United Kingdom

Research in metadiscourse has foregrounded the ways in which writers build a relationship with readers through internal discourse where textual choices engage readers, signal the flow of ideas, and indicate the writer's stance towards those ideas. Yet, despite a substantial body of research undertaking textual analysis of metadiscourse used in writing, few studies consider the relationship between the texts writers create and the metalinguistic thinking which informs their decision-making as writers. This paper draws on data from a study which sought to address this gap by investigating both the occurrence of metadiscourse in students' writing and their metalinguistic understanding of metadiscourse usage in their own texts. The sample comprised 195 students who wrote argument texts in both Arabic (first language) and English (second language), generating a corpus of 390 texts. Interviews were conducted with a sub-sample of 41 students to determine their metalinguistic thinking. In this paper we focus on *transitions* – the internal devices which mark the steps and connections in the discourse. The analysis evidences limited metalinguistic understanding of the metadiscoursal function of transitions, but strong understanding of the linking function of transitions. This understanding tends to foreground the textual, rather than interpersonal role of transitions, emphasising the semantic and ideational. The paper argues that developing students' metalinguistic understanding of this interpersonal role would empower them to make more strategic and informed use of transitions in their own writing.

Metalinguistic questioning: how teachers develop understanding of linguistic choice.
Keywords: Dialogic Pedagogy, Qualitative Methods, Teaching Approaches, Writing/Literacy
Presenting Author: Ruth Newman, University of Exeter, United Kingdom

This paper presents findings from an ongoing ESRC funded study focused on the investigation and development of an evidence-based pedagogy for metalinguistic talk about writing. Working with 7 teachers and their Key Stage 3 classes (students aged 11-14) in the South West of England, pedagogical strategies, co-constructed iteratively with teachers, emphasise questioning and discussion of linguistic choice. Data analysis reveals how the interweaving of questioning which initiates a student response, invites elaboration, but also focuses attention on specific linguistic features and their effects, can support students' verbalisation of linguistic choice and the development of their metalinguistic understandings. Drawing on a multi-layered, inter-related dataset of observational and textual data drawn from 7 sample classes, this paper will illustrate how teachers *adjust* metalinguistic questioning according to the understandings of their students, revealing the complexity of managing and promoting metalinguistic talk with students who vary in terms of attainment, linguistic confidence, and textual experience. This paper, and the findings arising from the wider project, contribute to theoretical understandings of metalinguistic talk in writing instruction, whilst contributing pedagogical strategies that may support teachers and students in implementing metalinguistic talk.

The effect of written metalinguistic feedback on cognitive effort and revision success
Keywords: Cognitive Skills and Processes, Engineering Education, Feedback, Writing/Literacy
Presenting Author: Jan-Mikael Rybicki, Aalto University, Finland; **Co-Author:**Wilhelmiina Hämäläinen, Aalto University, Finland; **Co-Author:**Kari K. Pitkänen, University of Helsinki, Finland; **Co-Author:**Lauri Malmi, Aalto University, Finland

Feedback is an important component in teaching academic writing and helps students to learn the conventions needed in writing their bachelor and master's theses. Although written corrective feedback (WCF) has been extensively researched in recent decades within second language (L2) writing instruction, the findings are mixed in terms of understanding which WCF approaches are the most efficient and in which contexts.The general consensus seems to be that less is more, but feedback on just a couple of error types in academic writing tasks can be dissatisfying both for learners to receive and teachers to provide. In the field of writing research, the cognitive processes in writing and revision have typically excluded the analysis of WCF. Nevertheless, the cognitive models of writing and revision processes could allow explaining some of the mixed findings in WCF research.
To examine the influence of cognitive load caused by WCF on revision success, this study analyses the metalinguistic WCF and subsequent revisions in student texts. The study was conducted in an online academic writing course for university-level engineering students. The results indicated that cognitive load had a moderately strong correlation with revision success. Particularly, the more cognitively demanding WCF reduced the probability of students being able to revise their texts. Therefore, writing instructors should evaluate the cognitive load of the WCF they give on student writing and adjust the type and focus of feedback accordingly.

ICT in effective writing interventions: an empirical review
Keywords: Computer-assisted Learning, Digital Literacy and Learning, Instructional Design, Writing/Literacy
Presenting Author: María Victoria González Laguna, University of León, Spain; **Co-Author:**Raquel Fidalgo, University of León, Spain, Spain; **Co-Author:**Gert Rijlaarsdam, University of Amsterdam, Netherlands

Information and Communication Technologies (ICTs) have changed the nature of instructional writing practices. This has led to the need to incorporate ICTs into traditional practices, requiring knowledge of the content, uses and pedagogical potential of ICTs.Thus, the aim of this study is to explore which of the activities in the teaching of writing included in effective instructional designs can be taken over by ICT.A review was conducted following the PRISMA Statement guidelines. The documentary search was performed through Web of Science and Scopus and, after applying inclusion and exclusion criteria, the final sample consisted of 22 empirical articles. These were analyzed according to two dimensions. For the content dimension, Intermediate Learning Objectives were analyzed, identifying their object of learning and type of knowledge. Regarding the instructional dimension two elements were analyzed: a) Learning Activities, identifying their type and use or non-use of ICTs; and b) Instructional Activities, identifying their typology, ICT used, and scaffolding provided. Findings showed most ICTs were focused on teaching high-level cognitive writing processes, providing declarative and procedural knowledge. Regarding the instructional dimension, all learning activities can be realized through ICTs, which reduce teaching workload by taking over instructional tasks as explaining contents or providing strategic and/or metacognitive scaffolding. In conclusion, this information allows researchers to know in detail the elements that can contribute significantly to the intervention's success. Likewise, at educational level, it provides useful information for applying ICTs in classroom, showing their characteristics and contents that can be covered by them.

Session G 12

23 August 2023 17:00 - 18:30
UOM_A11
Single Paper
Learning and Social Interaction, Motivational, Social and Affective Processes

Parental Involvement in Learning

Keywords: Art Education, Cognitive Development, Competencies, Developmental Processes, Early Childhood Education, Gender Issues, Motivation, Parental Involvement in Learning, Parents' Beliefs and Affect, Primary Education, Science and STEM
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 08 - Motivation and Emotion
Chairperson: ELENI VASILAKI, University of Crete, Greece

How Can Parents Encourage Adolescents to Choose a Non-Gender Stereotyped High School Major?
Keywords: Gender Issues, Motivation, Parental Involvement in Learning, Science and STEM
Presenting Author: Idit Katz, Ben-Gurion University of the Negev, Israel; **Co-Author:**Tzvia Samuha, The Ben-Gurion University of the Negev, Israel; **Co-Author:**Ortal Slobodin, Ben-Gurion University of the Negev, Israel

This study examined whether gender interacts with parental autonomy support in predicting adolescents' motivation while choosing a high school major and the mediating role of identity processing style in this relationship. Based on self-reports of 571 9th-grade students (296 boys), we found that the relationship between adolescents' perceived parental autonomy-support and their ability to make an autonomous choice of a high school major varied between genders and fields. Boys' autonomous choice of a non-STEM high school major was more strongly linked to their parents' support than girls' motivation to make a similar choice. Girls' autonomous choice of STEM as a high school major was more strongly related to the provision of parental support than boys. The informative identity style mediated the relationship between parental autonomy support and adolescents' experience of autonomy for boys and girls. Our findings highlight the role of

socio-cultural, familial, and personal variables in making a first career decision.

Parental beliefs and their influence on learning an instrument at primary school age
Keywords: Art Education, Competencies, Parents' Beliefs and Affect, Primary Education
Presenting Author: Patrizia Bieber, University of Tübingen, Germany; **Co-Author:**Barbara Busch, Mannheim University of Music and Performing Arts, Germany; **Co-Author:**Jessika Golle, University of Tübingen, Germany; **Co-Author:**Richard Goellner, University of Tuebingen, Germany

Parental beliefs can have an important impact on student's learning motivation as well as on their learning behavior (Eccles, 1993; Simpkins et al., 2012). This is known especially from STEM-related studies (Frenzel et al., 2010; Šimunović & Babarović, 2020). In our study, we aim to investigate to what extent parental beliefs affect children's learning behavior in terms of learning an instrument at primary school age. Therefore, we use a longitudinal study design, collecting data from $N = 162$ parents, $N = 176$ children, and their instrumental teachers ($N = 73$). The study started in November 2021 and is spread over the period of one year.A parent questionnaire was developed with twelve separable scales, providing satisfying reliabilities.Results from the first data collection show correlations between the children's motivation and their parents' beliefs towards the relevance of making music for personality development, as well as their beliefs regarding their children's self-responsibility. Moreover, findings from the second data collection indicate that parental beliefs regarding practicing are related to children's learning progress, whereas parental control beliefs were negatively correlated with children's motivation in instrumental lessons.

What parents do for their children – links with their expectations and child's indicators
Keywords: Competencies, Early Childhood Education, Parental Involvement in Learning, Parents' Beliefs and Affect
Presenting Author: Anne-Mai Meesak, Tallinn University, Institute of Educational Sciences, Estonia; **Co-Author:**Dmitri Rozgonjuk, University of Tartu, Institute of Computer Science, Estonia; **Co-Author:**Tiia Õun, Tallinn University, Institute of Educational Sciences, Estonia; **Co-Author:**Eve Kikas, Tallinn University, Estonia

Studies have shown that what parents do for their children matters. Children whose parents do more activities at home with them, who are taken to extracurricular activities and whose parents are involved in kindergarten activities have better social-emotional and cognitive skills and exhibit less disruptive behaviours. However, the evocative effect between children's developmental indicators and parental activities is less studied. Also, the relation of parental home activities and expectations for outcomes should be explored. The aim of this study is to show the links between the activities parents do for their children, parental perceptions of their children's developmental indicators and expectations for skills needed for starting primary education. The research will show which aspects predict the activities parents do with their children at home. 334 parents from 46 kindergartens across Estonia filled out a questionnaire in the autumn of 2021. The preliminary results showed that parents who believe their children have less cognitive difficulties do more language or math related activities with them. Children who have fewer social difficulties, less disruptive behaviours and better learning behaviours are taken to more extracurricular activities. The level a parent is involved in kindergarten activities is positively related to doing more social activities with a child at home and parents' expectations in language and math are also related to the activities parents do with their children at home.

Role of teachers' and parents' evaluations in the development of motivation and achievement
Keywords: Cognitive Development, Developmental Processes, Motivation, Parents' Beliefs and Affect
Presenting Author: Satu Koivuhovi, University of Turku, Finland; **Co-Author:**Mari-Pauliina Vainikainen, Tampere University, Finland

Teacher's and parents' evaluations and expectations of child's ability have shown to be important for the formation of children's self-appraisals. In this study, we used longitudinal data (N=1065) of elementary school pupils in Finland for examining the development of children's motivational self-beliefs and achievement and the role of teacher's and parents' evaluations in it. Results showed that teacher's evaluations of a child's academic schoolwork skills are stronger predictor of child's own motivational beliefs during the school years whereas evaluations of parents' had predictive value at the beginning of school. Girls were evaluated more positively both by parents' and teachers' in all the measurement points but overall this was not reflected in their self-evaluations or achievement. Girls did see themselves as more industrious than boys at grade 4 but boys surpassed girls in achievement at grade four and their ability beliefs and expectations for success developed more positively than girls' beliefs. Mother's education level was a significant predictor of children's motivational self-beliefs and achievement as well as teacher's evaluations at all time points. In other words, children whose mothers were highly educated were evaluated more positively by teachers both at the beginning of school years but their evaluations as well as self-beliefs and achievement developed more positively than children's with less educated mothers.

Session G 13

23 August 2023 17:00 - 18:30
UOM_A06
Single Paper
Cognitive Science, Motivational, Social and Affective Processes

Mathematical and Test Anxiety

Keywords: Achievement, Anxiety and Stress, Classroom Assessment, Educational Neuroscience, Emotion and Affect, Mathematics/Numeracy, Metacognition, Primary Education, Quantitative Methods, Secondary Education, Teacher Effectiveness
Interest group: SIG 08 - Motivation and Emotion, SIG 22 - Neuroscience and Education
Chairperson: Liv Håberg, Volda University College, Norway

The impact of mathematics anxiety on arithmetic performance: a dual-task study.
Keywords: Anxiety and Stress, Mathematics/Numeracy, Primary Education, Quantitative Methods
Presenting Author: Serena Rossi, Loughborough University, United Kingdom; **Co-Author:**Krzysztof Cipora, Loughborough University, United Kingdom; **Co-Author:**Sara Caviola, University of Padova, Italy; **Co-Author:**Irene C. Mammarella, University of Padova, Italy; **Co-Author:**Iro Xenidou-Dervou, Loughborough University, United Kingdom

Anxiety may influence mathematics performance by affecting cognitive processes such as Working Memory (WM) and attentional control (Eysenck & Calvo, 1992; Eysenck et al., 2007). Specifically, mathematics anxiety (MA) may activate intrusive thoughts and attentional bias on threat-related stimuli that could reduce WM resources necessary for solving the task at hand, thus resulting in poorer performance. This study aimed at investigating the interplay between MA and WM by implementing a dual-task paradigm. 428 4^{th} and 5^{th} graders (9-10 years old) were tested in their school settings. First, we assessed the children's MA. Then, they were presented with three computerized tasks: an arithmetic task presented in a stand-alone condition (primary task), a word recall task stand-alone (secondary task), and a condition where they had to perform the arithmetic and the word recall task concurrently (dual-task). To test whether children with elevated MA have a specific attentional bias toward threat-related stimuli, we manipulated the type of words presented in the secondary task, namely they were presented with: Neutral, Mathematics-related, or Emotional words. Results demonstrated that WM load impacted performance, and this was further amplified by the individuals' MA. However, we found only a limited effect of MA based on the type of words presented in the trials. Our finding generates important implications for research in the domain of MA and its relationship with mathematics performance.

Reducing mathematical test anxiety: why different interventions lead to similar outcomes
Keywords: Achievement, Educational Neuroscience, Emotion and Affect, Mathematics/Numeracy
Presenting Author: Yulia Kovas, Goldsmiths University of London, United Kingdom; **Co-Author:**Evgeniia Alenina, National Research University Higher School of Economics, Russian Federation; **Co-Author:**Maxim Likhanov, National Research University Higher School of Economics, Russian Federation; **Co-Author:**Elina Tsigeman, National Research University Higher School of Economics, Russian Federation

Only a handful of studies reported effectiveness of methods to reduce mathematics anxiety before the exam, such as physical exercises (Pascoe et al., 2020), expressive writing (Ramirez & Beilock, 2011a) and reappraisal. However, the efficacy and size of effect of these regulation techniques remain unclear. Some

studies find positive effects (Mesghina & Richland, 2020; Park et al., 2014); whereas other studies fail to find the effects (Camerer et al., 2018; Reinhold et al., 2018). We tested the efficacy of expressive writing, short motor exercises, and reappraisal techniques of emotional regulation before a mathematics test. More than 3000 students and schoolchildren participated in the experimental study. The results demonstrated no overall significant differences in efficacy between the tree types of regulation. However, some small differences were found in participants with high mathematics anxiety. The results shed a light on effectiveness and replicability of existing emotional regulations approaches. We discuss the results in the context of existing evidence from twin studies on the aetiology of mathematical anxiety.

Positive teachers' perceptions foster children's math performance against math anxiety
Keywords: Anxiety and Stress, Mathematics/Numeracy, Metacognition, Teacher Effectiveness
Presenting Author: Enrica Donolato, University of Oslo, Norway; **Presenting Author:**Sara Caviola, University of Padova, Italy; **Co-Author:**David Giofrè, School of Psychology, University of Leeds, United Kingdom; **Co-Author:**Irene C. Mammarella, University of Padova, Italy

Mastering math skills are essential for students' educational and work success. Recent research has examined how children's math anxiety and math skills are shaped by core socializers, such as the interplay between children and teachers. To the best of our knowledge, however, no research has examined the relationship between students' math attainment, their math anxiety levels and how their relationship with teachers, evaluated from both students' and teachers' perspectives, may come into play. The present contribution aims to address this gap and test the potential mediational role of math-related metacognitive beliefs in a sample of schoolchildren.This study involves 269 5^{th} to 7^{th} graders (128 M; mean age = 11.55 years) and their math teachers. Children completed self-report questionnaires assessing their math-anxiety levels and the quality of their relationship with math teachers. They also completed a series of standardized math tasks. Conversely, math teachers filled out questionnaires to evaluate their relationship with students and their perception of students' math-related metacognitive beliefs.We conducted path analyses to test whether math-related metacognitive beliefs mediated the association between math anxiety and student-teacher relationships with children's math skills. We evaluated this hypothesis in two distinct models that examined the student-teacher relationship assessed from the students' or teachers' perspectives. Both models showed that math-related metacognitive beliefs mediated the relationship between students' math anxiety and their relationship with the teachers, on the one hand, and their math skills, on the other hand. Theoretical and practical implications will be discussed.

Test anxiety fluctuations during secondary school assessments: the role of basic psychological needs
Keywords: Anxiety and Stress, Classroom Assessment, Emotion and Affect, Secondary Education
Presenting Author: Stefanie De Jonge, Ghent University, Belgium; **Co-Author:**Evelien Opdecam, Ghent University, Belgium; **Co-Author:**Leen Haerens, Ghent University, Belgium

Test anxiety poses a fundamental educational challenge as it has been associated with lower academic performance, decreased self-efficacy and lower well-being. Prior literature has addressed test anxiety at one point in time during end-of-term exams. Only a few studies have focused on test anxiety fluctuations in educational contexts with weekly assessments. Grounded in the Self-Determination Theory, this study examines test anxiety fluctuations and how it relates to fluctuations in basic psychological needs satisfaction and frustration, an unexamined potential test anxiety antecedent. Three test anxiety scales and students' need-based experiences were administrated to 253 11th and 12th grade secondary school students at three different times. Multilevel analyses revealed that students showed higher test anxiety in weeks in which their need for competence was more frustrated. This association was robust across the three test anxiety instruments and after accounting for important test anxiety covariates (e.g., gender and prior achievement). These findings imply that reducing competence frustration is important when designing test anxiety-reducing interventions.

Session G 14

23 August 2023 17:00 - 18:30
AUTH_T002
Single Paper
Culture, Morality, Religion and Education, Instructional Design, Teaching and Teacher Education

Minority Students and Cultural Diversity in Schools

Keywords: Attitudes and Beliefs, Citizenship Education, Cultural Diversity in School, Instructional Design, Knowledge Construction, Migrant / Refugee and Minority students, Morality and Moral Development, Pre-service Teachers, Religiosity and Spirituality, Social Aspects of Learning and Teaching
Interest group: SIG 13 - Moral and Democratic Education, SIG 19 - Religions and Worldviews in Education, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: BOBBY HOFFMAN, University of Central Florida, United States

Non-religious pupils in RE: Exploring differences in cognitive activation and relevance beliefs
Keywords: Attitudes and Beliefs, Cultural Diversity in School, Religiosity and Spirituality, Social Aspects of Learning and Teaching
Presenting Author: Alexander Unser, TU Dortmund University, Germany

This presentation draws on the ongoing discussion in some European countries about whether and how non-religious worldviews and pupils should be included in religious education (RE). Currently, this discussion lacks empirical knowledge about the specific learning conditions of these pupils in RE – a desideratum that this paper addresses. Building on a classification of non-religiosity proposed by Lois Lee, this presentation distinguishes between pupils that show anti-religious, indifferent and positive different relations to religion. It investigates whether they differ significantly from other pupils in RE classes regarding cognitive activation and relevance beliefs. To this end, this presentation draws on data from 952 pupils who attended Catholic or Protestant religious education classes in southwestern Germany (state of Baden-Württemberg). ANOVAs with additional Welch tests and post-hoc tests (Scheffé or Dunnett-T3) were computed to test for differences between the subgroups. The results of the ANOVAs show that pupils with anti-religious, indifferent and positive different relations indeed have lower scores in cognitive activation and relevance beliefs than the majority of pupils, which can be interpreted as an indicator of poorer learning conditions for the former. The differences found have medium to large effect sizes ($0.095 < \eta^2 < 0.188$). Furthermore, significant differences were found between pupils with anti-religious, indifferent and positive different relations, which underlines the importance of distinguishing between different types of non-religiosity in the discussion.

Using VaKE in higher education in Georgia: Experiences and challenges
Keywords: Cultural Diversity in School, Instructional Design, Knowledge Construction, Morality and Moral Development
Presenting Author: Ekaterine Shaverdashvili, Ilia State University, Georgia; **Co-Author:**Tamar Mosiashvili, Illa University, Georgia; **Co-Author:**Magda Gogrichiani, Ilia University, Tbilisi, Georgia

Moral values towards democracy and individual responsibility are considered important goals in modern Georgian education. A challenge was that they represent a complete turnaround compared to the ideological values education system practised in Soviet times in Georgia. It is a significant part of the National Curriculum and teachers' preparation and professional development programs. The goal of the National Curriculum is to develop values as crosscutting competencies. In 2016, V*a*KE was introduced in Georgia through an ERASMUS+ project; it fits society's needs quite well. Between 2016 and 2019, the VaKE Model and courses adapted to the Georgian conditions including the Georgian framework of teachers' professional standards and the National Curriculum, were developed and implemented in eight Georgian universities that provide teacher training courses. Few teachers encountered challenges; most reported no problems with applying V*a*KE. One of the V*a*KE courses in a teacher preparation training program is analysed in more detail. The course is an integral part of teachers' certification exams. The study focuses on the factors of interest, use in practice, cooperation, activity, innovation and over-challenge; these are issues that are important to check whether the implementation of V*a*KE is following the theoretical requirements. Students' responses are measured through an adapted questionnaire on a 5-point Likert scale. The students are highly satisfied, can easily comply with the tasks, and show high cooperation; their primary

challenge is how to formulate good dilemmas. Consequences for values education in Georgia using V*a*KE are discussed.

Implicit and Explicit Attitudes of Pre-service Teachers: The Case of Ethnicity and Sexuality
Keywords: Attitudes and Beliefs, Cultural Diversity in School, Migrant / Refugee and Minority students, Pre-service Teachers
Presenting Author: Andreas Gegenfurtner, University of Augsburg, Germany; **Co-Author:**Aldin Alijagic, University of Augsburg, Germany; **Co-Author:**Sylvia Gabel, Universität Augsburg, Germany; **Co-Author:**Özün Keskin, University of Augsburg, Germany; **Co-Author:**Jule Neubauer, University of Augsburg, Germany; **Co-Author:**Markus Dresel, University of Augsburg, Germany

Research indicates that ethnic and sexual minority students are often marginalized at school. Teacher attitudes might contribute to the disadvantages minority students tend to experience. So far, most research on teacher attitudes has focused on majority teachers. As a remedy, the two studies presented in this proposal compare majority and minority teachers. The goal was to estimate the extent to which attitudes differ as a function of German pre-service teachers' own ethnic background and sexual orientation. Study 1 focused on attitudes toward students with a Turkish migrant background, the largest ethnic minority group in German schools. Study 2 focused on attitudes toward homosexual students. In both studies, implicit association tests measured implicit attitudes while a feeling thermometer measured explicit attitudes. We also assessed pre-service teachers' enthusiasm, self-efficacy, stereotypes, and beliefs associated with teaching Turkish migrant and homosexual students. Results of both studies suggest that the correlations between implicit and explicit attitude measures were relatively small. In Study 1, ethnic minority pre-service teachers showed significantly higher levels of explicit attitudes and enthusiasm than ethnic majority pre-service teachers. In Study 2, bisexual and homosexual pre-service teachers showed significantly higher levels of implicit attitudes, explicit attitudes, and enthusiasm than heterosexual pre-service teachers. We discuss these findings with regard to ingroup favoritism in social identity theory and the benefits of a heterogeneous teaching workforce for ethnic and sexual minority students in classrooms.

Finnish ethnic minority youth constructing civic identity
Keywords: Attitudes and Beliefs, Citizenship Education, Cultural Diversity in School, Migrant / Refugee and Minority students
Presenting Author: Anuleena Kimanen, University of Turku, Finland; **Co-Author:**Samaneh Khalili, University of Turku, Finland; **Co-Author:**Aleksi Seger, University of Turku, Finland; **Co-Author:**Jenni Alisaari, University of Turku, Finland; **Co-Author:**Elina Kilpi-Jakonen, University of Turku, Finland

Civic identity is formed during adolescence in formal, non-formal and informal educational contexts. It has been defined as sense of connection and responsibility to act for a common good. Both sense of connection and civic engagement of ethnic minority youth have specific features in the Western countries. In our study we have interviewed ethnic minority youth aged 15–19 in a Finnish neighbourhood with high cultural diversity about their social and civic engagement. We expand the notion of civic identity to a discursive process where the young people define themselves as actors in the communities they belong to. In addition to the degree and forms of belonging and action with and for others, the discursive analysis pays attention to the sense of having a voice and the young people's concerns. Action took forms of helping, creating community spirit and supporting younger children. Having a voice was constructed as leadership in some cases, as a consequence of action in others, and still in other cases as a vague self-evidence. However, their concerns driving their civic action were not very societal, but rather local or personal, constructing an identity of a local actor or actor within the community of peers. The elements of civic identity (belonging, action, voice and concern) and their obstacles identified in this study may guide civic education to foster active citizenship for ethnic minorities more efficiently.

Session G 15

23 August 2023 17:00 - 18:30
AUTH_T102
Single Paper
Higher Education, Learning and Instructional Technology

Motivation and Self-regulated Learning

Keywords: Achievement, At-risk Students, E-learning/ Online Learning, Educational Attainment, Educational Technologies, Higher Education, Motivation, Self-regulated Learning and Behaviour, Tool Development, Vocational Education and Apprenticeship Training
Interest group: SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 14 - Learning and Professional Development
Chairperson: Salome Flegr, Ludwig-Maximilians-Universität (LMU), Germany

Promoting self-regulated learning in children's daily lives: The effects of a mobile intervention
Keywords: E-learning/ Online Learning, Educational Technologies, Motivation, Self-regulated Learning and Behaviour
Presenting Author: Jasmin Breitwieser, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Lea Nobbe, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Daniel Biedermann, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Garvin Brod, DIPF | Leibniz Institute for Research and Information in Education, Germany

Mobile technologies offer new opportunities for encouraging children to learn in their daily lives. In this pre-registered study, we tested what kind of mobile intervention helps children maintain a regular study routine for vocabulary learning. Study behavior was measured objectively and with high ecological validity using logfiles of a vocabulary app that the children used. The mobile intervention was delivered via a separate study app and combined two critical components: planning and prompting. Children (N = 130, mean age = 10.75 years) first received a digital instruction on the benefits of distributed practice. Children in the full intervention group also formulated a plan for when and where to learn vocabulary. On about half of the next 36 days (within-subject manipulation), they received prompts reminding them of the instruction and the plan. The comparison groups lacked either the prompting or planning intervention component (between-person manipulation). The results revealed that the reminder prompts had a positive but only short-term effect on whether or not children learned vocabulary on a given day. Planning, in contrast, had a more long-term impact in that it helped children maintain a high frequency of learning over time. Overall, our findings show that mobile interventions can be highly effective in supporting SRL in children. We discuss the results in light of theoretical assumptions about the different mechanisms underlying planning and prompting effects, and highlight the practical importance of finding the optimal frequency of prompting.

Designing Self-Regulation interventions for different target groups in Entrepreneurship Education
Keywords: Motivation, Self-regulated Learning and Behaviour, Tool Development, Vocational Education and Apprenticeship Training
Presenting Author: Tobias Jenert, Paderborn University, Germany; **Co-Author:**Ronja Büker, Paderborn University, Germany

Entrepreneurs differ from the average population in various personal characteristics. These include a high level of self-efficacy, excessive optimism and selective information processing. These characteristics are important because they make it easier to take risks and make quick decisions. At the same time, these characteristics can lead to entrepreneurs neglecting tasks and information that would be relevant for successful firm development. Overestimated profit expectations, for example, are a frequent reason for the failure of startups.
This results in a contradiction: On the one hand, certain personal characteristics are necessary for entrepreneurs to engage in a start up at all, on the other hand, they are themselves a reason for failure. To counteract this contradiction, we developed an intervention that supports entrepreneurs in recognizing and actively managing their own dispositions in dealing with entrepreneurial action and decision-making situations. As a theoretical framework, we use the established concept of self-regulated learning according to Zimmerman (2000) to promote entrepreneurial self-regulation in the dimensions of cognition, motivation and metacognition. To tackle the challenge of developing an intervention, which is adaptable to the needs of specific target groups and contexts, we used a research design, which incorporates principles of Design-Based research. In our talk, we specifically discuss the issue of how to develop a research design which on the one hand tests for (statistical) effectiveness, and on the other hand is adaptable to the needs of different target groups and their respective contexts.

Motivational Regulation, Academic Effort, and Academic Success Among International Students
Keywords: Achievement, At-risk Students, Educational Attainment, Higher Education

Presenting Author:Hüseyin Hilmi Yildirim, FernUniversität in Hagen, Germany; **Co-Author:**Julia Zimmermann, FernUniversität in Hagen, Germany; **Co-Author:**Kathrin Jonkmann, FernUniversität in Hagen, Germany

Motivational regulation is an important predictor of academic effort and, thus, of academic success. Yet, little is known about its importance with regard to the GPA and study satisfaction of international students in Germany. Therefore, we analyzed these contingencies with a set of cross-sectional, semi-longitudinal, longitudinal, and longitudinal autoregressive mediation models (N = 1,060). The analyses substantiated indirect effects of different motivational regulation strategies on grade point average and study satisfaction via academic effort in cross-sectional, semi-longitudinal, and longitudinal models, but not in the full longitudinal autoregressive mediation model. We discuss theoretical and methodological implications of these findings as well as practical inferences for the counselling of international students in Germany.

Session G 16

23 August 2023 17:00 - 18:30
UOM_A07
Single Paper
Cognitive Science

Educational Neuroscience

Keywords: Cognitive Skills and Processes, Comprehension of Text and Graphics, Critical Thinking, Digital Literacy and Learning, Educational Neuroscience, Instructional Design, Mathematics/Numeracy, Primary Education, Quantitative Methods
Interest group: SIG 22 - Neuroscience and Education
Chairperson: Eva Lindgren, Umeå University, Sweden

Rhythm perception fosters motor skills through music training: a neurobehavioral study with children
Keywords: Cognitive Skills and Processes, Educational Neuroscience, Primary Education, Quantitative Methods
Presenting Author: Marta Martins, University Institute of Lisbon (ISCTE-IUL), Portugal; **Co-Author:**Daniela Coimbra, Polytechnic Institute of Porto, Portugal; **Co-Author:**Ana Mafalda Reis, Unilabs - Boavista, Portugal; **Co-Author:**Christian Gaser, Friedrich Schiller University of Jena, Germany; **Co-Author:**São Luís Castro, Faculty of Psychology and Educational Sciences, University of Porto, Porto, Portugal, Portugal

Rhythm and motor function are intrinsically linked to each other and to music, but evidence on the rhythm-motor interplay during music training, and the brain-related mechanisms, is scarce. Here, we asked if rhythm skills play a role in the fine-motor improvements resulting from music training, and which brain regions would be implicated. We conducted a longitudinal study in natural school settings and compared the effects of a 6-month music training to those of a sports training and to a passive control. Fifty-seven third graders were pseudorandomly assigned to music (n = 21), sports (n = 18), and control (n = 18) groups. They completed a structural scan, and rhythm and fine-motor tasks before and after training. Better pre-training rhythm perception was related to less gray matter volume in regions of the cerebellum, fusiform gyrus, supramarginal gyrus, ventral diencephalon, inferior/middle temporal gyri, and superior frontal gyrus and motor area. Music training improved motor performance, and greater improvements were associated with better pre-training rhythm discrimination. Music training led to a significant loss of gray matter volume in the left cerebellum and fusiform gyrus cluster, and volume loss correlated to higher motor gains. No such effects were found for sports and control groups. Summing up, children with fine-tuned rhythm perception are more prone to improve fine-motor skills through music training, and this rhythm-motor interplay is to some extent handled by the left cerebellum and fusiform gyrus. These findings have implications for models of music-related plasticity and rhythm cognition, and for educational/clinical programs targeting motor function.

The Effect of Problem Format on Children's Arithmetic Performance
Keywords: Comprehension of Text and Graphics, Instructional Design, Mathematics/Numeracy, Primary Education
Presenting Author: Iro Xenidou-Dervou, Loughborough University, United Kingdom; **Co-Author:**Emine Simsek, Loughborough University, United Kingdom; **Co-Author:**Ilona Friso - van den Bos, University of Twente, Netherlands; **Co-Author:**Menno Van der Schoot, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Sara Rashid, Cambridge University, United Kingdom; **Co-Author:**Ruth Trundley, Devon Education Services, United Kingdom; **Co-Author:**Ernest Van Lieshout, Vrije Universiteit Amsterdam, Netherlands

In primary school education, arithmetic problems can be presented in various formats, e.g., in a symbolic format (e.g., 32 + 15 = ?) or as word problems, which may or may not be accompanied by illustrations. Past studies have identified three types of illustrations in Dutch mathematics textbooks: helpful, unhelpful and illustrations that entail essential information and indicated that they can have a detrimental effect on children's arithmetic performance (Berends & van Lieshout, 2009). The present study's aims were to examine a) if similar formats are used in UK mathematics textbooks and b) the effect that they have on young children's arithmetic performance. Our textbook analysis showed that UK mathematics textbooks entail similar arithmetic problem formats, namely bare word problems and word problems accompanied by helpful, unhelpful, and essential illustrations. The highest percentage of illustrations entailed essential information. To elucidate the role of problem formats, a sample of 220 6- to 10-year-olds (Year 3 and Year 4) completed a mathematics task involving 20 two-digit mental arithmetic problems (addition and subtraction), presented in five different conditions: (1) Symbolic, (2) Bare word problem, word problem accompanied by (3) an Unhelpful, (4) a Helpful, and (5) an Essential illustration. As expected, our results showed that the children performed best (accuracy and RT) in the symbolic condition. Also, they were slowest in the Essential condition, but other illustrations did not have a negative effect. Results are discussed in the context of Cognitive Load Theory and bring forth implications regarding instructional design in mathematics education.

Effects of emotionality on news credibility: Insights from self-reports and brain imaging
Keywords: Cognitive Skills and Processes, Critical Thinking, Digital Literacy and Learning, Educational Neuroscience
Presenting Author: Mareike Bacha-Trams, Research Methods in Psychology – Media-based Knowledge Construction, Faculty of Engineering, University of Duisburg-Essen, Duisburg, Germany, Germany; **Co-Author:**Daniel Bodemer, Research Methods in Psychology – Media-based Knowledge Construction, Faculty of Engineering, University of Duisburg-Essen, Duisburg, Germany, Germany

In information searching processes as a part of informal learning, the distinction between reliable and less reliable information or news is essential. Furthermore, the use of online media as a source for news is rising. As online media are increasingly infiltered by fake news (i.e. news intentionally created to deceive or manipulate the recipient), it is important to understand processes of news evaluation and to develop strategies to foster critical media literacy. In this multidisciplinary study, we used a combination of self-reports and brain imaging to examine the neurocognitive processes of fake news evaluation. In a three factorial within-subject design, we examined the effect of features of the stimuli such as the topic, writing style and source on the perceived credibility of the news. The analyses suggest that from all examined variables, only the writing style affected the news' credibility, while the news' topic and source did not influence the perceived credibility. Exemplary fMRI results of one study subject indicate brain activation in areas associated with emotion processing and reward when the subject rated the news' credibility. Taken together, our results suggest that the affective and social aspect of news evaluation is of major importance for rating the perceived credibility. Thus, studying learning processes using online media as a source for information and also instructing learning processes regarding news evaluation should not solely focus on cognitive processes but should also consider emotional features of news articles and include social and affective neurocognitive mechanisms.

Session G 17

23 August 2023 17:00 - 18:30
AUTH_TE2
Single Paper
Higher Education, Learning and Instructional Technology, Teaching and Teacher Education

Technology-enhanced Teaching

Keywords: Assessment Methods, Computational Thinking, Computer-assisted Learning, Educational Technologies, Higher Education, Mixed-method Research, Motivation, Pre-service Teachers, Qualitative Methods, Teacher Professional Development, Teaching Approaches, Teaching/Instructional Strategies
Interest group: SIG 01 - Assessment and Evaluation, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Matthias Huber, Austria

Realizing adaptive teaching with educational technology? A benefit for low achieving school students
Keywords: Computer-assisted Learning, Educational Technologies, Mixed-method Research, Teaching Approaches
Presenting Author: Leonie Sibley, University of Tübingen, Germany; **Co-Author:**Andreas Lachner, University of Tübingen, Germany; **Co-Author:**Christine Plicht, University of Tübingen, Germany; **Co-Author:**Armin Fabian, University of Tuebingen, Germany; **Co-Author:**Christian Wettke, University of Tübingen, Germany; **Co-Author:**Thorsten Bohl, University of Tübingen, Germany

Educational technology has the potential to realize adaptive teaching by supporting formative assessments as well as adaptions on the macro and the micro level. Although educational research provided valuable, but technology intense approaches (e.g., ITS, dashboards), it is largely unclear how adaptive teaching can be realized with available tools and infrastructure, as well as which learner- (e.g., prior knowledge) and topic-related (e.g., domain) boundary conditions determine the effectiveness of technology-enhanced teaching. Against this background, we conducted a sequential mixed method study, in which we used qualitative data to explain quantitative results on a deeper level. In the quantitative phase, we first realized a ManyClasses study: In collaboration with eight high school teachers, we developed and evaluated 12 teaching units (N = 183 school students) in which educational technology was adopted to realize adaptive teaching and investigated students' knowledge gains and monitoring accuracy (judgment of learning). Results showed a large increase of knowledge and more accurate judgements of learning across all units. Interestingly, especially students with low prior knowledge benefited from the teaching units, and apparently, teaching units were mainly effective in the STEM but not languages domain. In the qualitative phase, we interviewed three teachers whose teaching units showed either small, medium, or large effects to further explore boundary conditions of implementing educational technology in adaptive teaching. Qualitative analyses revealed that regular formative diagnoses, monitoring students' individual or group work, and a didactical use of educational technology likely accounted for higher learning gains.

Epistemic changes when university teachers use digital technology in assessing student learning
Keywords: Assessment Methods, Educational Technologies, Higher Education, Qualitative Methods
Presenting Author: Linda Barman, KTH, Royal Institute of Technology, Sweden; **Co-Author:**Maria Weurlander, Stockholm University, Sweden

Digital technology is increasingly used in Higher Education assessment practices. The aim of the present study was to illuminate digital transformation by exploring teachers' experiences of using digital technology to assess students' performances. Twelve teachers from different disciplines located at two universities in Sweden were interviewed. From a theoretical position viewing assessment as a social practice, we analysed the data using a thematic analysis. The findings illuminate changes of different nature as result of the teachers' use of digital technology and relate to either *how* the teachers worked, (the assessment processes), or *what* the teachers designed and created, (the 'products', i.e. assessment tasks or course design). Overall, based on the teachers' design decisions in this study, the assessments via digital tools *converged*, making it harder for teachers to allow for variation in student responses. In contrast to the intentions reported by several teachers, the assessments became about measuring students' fulfilment of specified and detailed outcomes of learning ('the correct answer') and limited teachers' opportunities to provide supporting feedback (feedforward). As digital technology is increasingly being implemented in higher education and promises of technology-enhanced-learning are stressed, this study provide perspective in highlighting some concerning consequences regarding assessment of student learning. We argue that epistemic changes in assignments when digital technology is applied should be taken seriously and needs further exploration.

The educational potential of programming and the role of teachers. A scoping of systematic reviews
Keywords: Computational Thinking, Educational Technologies, Teacher Professional Development, Teaching/Instructional Strategies
Presenting Author: Synnøve H. Amdam, Volda University College, Norway; **Co-Author:**Sanna Forsström, University of Stavanger, Norway

Programming and computational thinking has become an important area of teaching and learning in education across the world, often linked to 21st century skills and what is needed for future citizens to function well in tomorrow's workforce. For instance, in Norway, programming was introduced in four subjects from year 2020 in the curriculum, mathematics, science, arts and crafts, and music. Computational thinking is additionally seen as a cross-curricular competence. However, the inclusion of programming and computational thinking in and across subjects in the curriculum also requires that teachers have the competence to include these themes in their teaching practices. In this scoping meta review of systematic reviews, we investigate what is the educational potential of programming in primary and secondary education, and what is required for teachers to be able to utilize this potential. We do this by first exploring how research through the last decade focus on the use of programming in educational contexts in primary and secondary education in 23 systematic reviews, and on the necessary means to develop teachers' professional digital competence in 12 systematic reviews. We then discuss the premisses and challenges for teachers' inclusion of programming and computational thinking in their teaching practices, through a further investigation of the teachers' role as presented across the included research.

Becoming a teacher to digitally transform education? Developing and applying the D(FIT)-Choice
Keywords: Educational Technologies, Higher Education, Motivation, Pre-service Teachers
Presenting Author: Judit Martínez Moreno, University of Education Zurich / University of Zurich, Switzerland; **Co-Author:**Dominik Petko, University of Zurich, Switzerland

The reasons for choosing a teaching career have been widely studied. However, only a few studies have investigated whether digital factors influence teacher students' decision of becoming a teacher. In this study, we answer this question by using the (D)FIT-Choice (Digital Factors Influencing Teacher Choice) scale, which we had previously developed and validated, with a sample of more than 230 beginning primary, lower and upper secondary teacher students. Preliminary results indicate that digital factors are among the least important reasons for becoming teachers. This is a cause for concern since this seems to contradict common expectations towards new generations of teachers. We also explore which factors are correlated with having higher levels of digital reasons to become a teacher. The main correlated factors are prior digital technology usage in education and perceived digital teaching competence, but also job security and job transferability. Learning more about the digital factors influencing teacher choice will contribute to better designing teacher education to foster an effective digital transformation in education.

Session G 18

23 August 2023 17:00 - 18:30
AUTH_T202
Single Paper
Educational Policy and Systems, Instructional Design, Learning and Social Interaction, Motivational, Social and Affective Processes

Informal Learning

Keywords: Attitudes and Beliefs, Cooperative/Collaborative Learning, Early Childhood Education, Educational Policy, Ethics, Gender Issues, Informal Learning, Instructional Design, Primary Education, Quantitative Methods, Science and STEM, Science Education, Social Aspects of Learning and Teaching, Social Media, Writing/Literacy
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 06 - Instructional Design, SIG 10 - Social Interaction in Learning and Instruction, SIG 12 - Writing
Chairperson: Tina Papathoma, Germany

Informal science learning: an overview of activity types and their design characteristics
Keywords: Informal Learning, Instructional Design, Science and STEM, Science Education
Presenting Author: Tessa Eysink, University of Twente, Netherlands; **Co-Author:**Natasha Dmoshinskaia, University of Twente, Netherlands; **Co-Author:**Hannie Gijlers, University of Twente, Netherlands

People learn science everywhere: at school, but especially outside school. This informal science learning is not only fun, but can also contribute to the development of people's science proficiency, which is a person's knowledge, skills and attitudes towards science. It is not clear, however, how different informal science learning activities contribute to the development of science proficiency and which design characteristics are important for that. In the current study, we interviewed more than 200 stakeholders (activity providers, school teachers, and participants/visitors of informal science learning activities) from 20 countries to get an overview of different types of activities and their design characteristics. Based on the interviews and a check on existing repositories covering informal science learning activities in Europe, 14 activity types in three contexts were identified. Moreover, based on the analysis of the interview data and literature, a set of key design characteristics and their success criteria were identified for each context. The results give insight into the design of successful learning activities and are input for the next steps: the development of a systematic assessment methodology for science proficiency and the analysis of the impact of different informal science learning activities.

School social media and the datafication of children
Keywords: Educational Policy, Ethics, Primary Education, Social Media
Presenting Author: Karley Beckman, University of Wollongong, Australia; **Presenting Author:**Tiffani Apps, University of Wollongong, Australia; **Presenting Author:**Sue Bennett, University of Wollongong, Australia

Digital platforms for learning, school management and communications are now routine in schooling systems, and social media use by schools has become part of the increasing digitalization of education. Yet the use of such platforms in school contexts raises critical questions about the data being collected about children through social media activity, how it is being used and what protections are afforded to children as a vulnerable social group. Drawing on children's digital rights and a data justice framing, this research investigates the data practices associated with school use of social media and the implications including the rights of children and their families. Using a mixed methods approach the research undertook content analysis of 200 primary school social media sites, and conducted case studies of five primary school leaders and six parents in Australia. The findings of the study show limitations in stakeholders' understanding of the use and reuse of children's data by social media platforms, thus highlighting a number of ethical concerns. We share suggestions for more considered and inclusive school social media policy and practices that better protect the rights of children.

Social dimensions of learning: unpacking the collaborative process in an online initiative
Keywords: Cooperative/Collaborative Learning, Informal Learning, Social Aspects of Learning and Teaching, Social Media
Presenting Author: Karin Ekman, University of Gothenburg, Sweden; **Co-Author:**Thomas Hillman, University of Gothenburg, Sweden

Since its inception, social media has both been hailed as a hopeful space for learning where the production of knowledge and exploration of ideas may be democratized and also been derided as a space that fosters intolerant and even hateful discourse. However, what discourse takes place on social media and how it might support learning is a matter of the details. Seeking to unpack these details, this paper reveals how social dimensions of learning can be identified through examination of the productive and exploratory elements of dialogue in an online informal community. These social dimensions are unpacked through analysis of the ways members of a Facebook group with a STEM focus communicate in relation to different topics of conversation. Social dimensions of learning in this context are seen in relation to the building of social ties through community work when engaging in collaborative problem-solving activities, idea development, and working together to understand common problems. Expanding on earlier research, the findings reveal ways that when considered in relation to the contextual aspects of dialogue, existing theory on exploratory elements can be reinterpreted to better understand social dimensions particular to learning in social media groups.

Children's Leisure Writing Activities and Related Beliefs
Keywords: Attitudes and Beliefs, Informal Learning, Primary Education, Writing/Literacy
Presenting Author: Lisa Birnbaum, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany; **Co-Author:**Stephan Kroener, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany

Recent research has shown that beliefs can explain children's leisure writing frequency. However, researchers are asking what types of text children are writing in their leisure time. This is followed by the question of whether certain beliefs are particularly explanatory of certain writing activities. This is where this study comes in: Questionnaire data from 1,054 German third-graders on their leisure writing activities and related beliefs were analyzed using regression analyses. Results showed that children were not writing that much in their leisure time. However, what drived them to write in their leisure time was primarily their intrinsic value. However, depending on the writing activity, other beliefs had substantial explanatory value. We discuss to what extent knowledge about recreational writing activities can help teachers and parents to promote writing experiences with different text forms among elementary school children.

Who cares? Gender role representation of same-sex parents in children's picture books
Keywords: Early Childhood Education, Gender Issues, Informal Learning, Quantitative Methods
Presenting Author: Lars Burghardt, University of Bamberg, Germany

Picture books are a central part of early childhood and contribute to the picture children form of the world. While most picture books are oriented towards the concept of heteronormativity, more picture books featuring same-sex parents have been published in recent years. This presentation addresses the question of how same-sex parents are portrayed in relation to gender roles. Data stems from 23 German-language picture books, 17 with two mothers, six with two fathers. A quantitative coding approach using was used to capture the portrayal of gender roles. In the presentation, in addition to the general depiction of gender roles, the focus is primarily on the depiction of care activities. The analyses showed that fathers, as well as mothers, are comparatively often shown emotionally or in caring activities, especially when the results of this study are compared to the state of research. Although in a large number of picture books both parents provide care and household-related activities, there is a statistically significant difference in the sample of two fathers in terms of one parent performing these activities more frequently. In this respect, it can be seen that the portrayal of same-sex parents is partially oriented towards heteronormative models, as these activates are usually depicted as female.

Session G 19

23 August 2023 17:00 - 18:30
UOM_R05
Single Paper
Learning and Social Interaction, Motivational, Social and Affective Processes

Teacher-Student Relationships, Student Adjustment and Academic Outcomes

Keywords: Cognitive Development, Emotion and Affect, Learning and Developmental Disabilities, Mathematics/Numeracy, Meta-analysis, Primary Education, Reading, Self-regulated Learning and Behaviour, Social Aspects of Learning and Teaching, Social Interaction, Teaching/Instructional Strategies
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 10 - Social Interaction in Learning and Instruction
Chairperson: Kati Sormunen, University of Helsinki, Finland

The role of student-teacher relationships for classroom adjustment and later academic achievement
Keywords: Mathematics/Numeracy, Reading, Self-regulated Learning and Behaviour, Social Interaction
Presenting Author: Ragnhild Lenes, University of Stavanger, Norway; **Co-Author:**Dieuwer ten Braak, University of Stavanger, Norway; **Co-Author:**Ingunn Størksen, University of Stavanger, Norway

Research has indicated that student-teacher relationship quality is associated with students' adjustment to the classroom, social competencies, and academic achievement (e.g, Roorda, Koomen, Spilt, & Oort, 2011). The present study investigated: 1) Do first-grade teachers` perceived conflict and closeness with students predict students' adjustment difficulty to the classroom and self-regulation in first grade and academic achievement in fifth grade? 2) Do first-grade teachers` perceived conflict and closeness have indirect effects on academic achievement in fifth grade through students` adjustment difficulty and self-regulation in first grade? The study included data from 240 Norwegian children. First-grade teachers reported perceived conflict and closeness with students through the Student-Teacher Relationship Scale (Pianta, 2001) and students` adjustment difficulty to the classroom through the Survey of Early School Adjustment Difficulty (Rimm-Kaufman, 2005). Self-regulation was directly assessed with the Head-Toes-Knees-Shoulders task (McClelland et al., 2014). Fifth-grade scores in reading comprehension and mathematical achievement derived from mandatory National assessments. Results showed that teacher-perceived conflict significantly predicted students` self-regulation ($\beta$=-.16**) and adjustment difficulty ($\beta$=.70***) in first grade but not academic achievement in fifth grade. Closeness in first grade directly predicted students` reading comprehension (β=.15*) in fifth. Teacher-perceived conflict in first grade had a significant indirect effect on reading comprehension in fifth grade through students` adjustment difficulty ($\beta$=-.18*). Closeness did not have a significant indirect effect on academic achievement. Findings are discussed in light of improving our understanding of the role of student-teacher relationships in students` adjustment, self-regulation, and academic achievement.

The relationship between teacher-child interaction and EF: A cross-cultural meta-analysis
Keywords: Cognitive Development, Meta-analysis, Social Aspects of Learning and Teaching, Teaching/Instructional Strategies
Presenting Author: Canmei Xu, KU LEUVEN, Belgium; **Co-Author:**Dieter Baeyens, KU Leuven, Belgium; **Co-Author:**Mariette Huizinga, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Wim Van Den Noortgate, KU LEUVEN, Belgium

Executive functions (EFs) are fundamental for children's learning, school functioning and academic achievement. Recent meta-analyses (e.g., Vandenbroucke et al., 2018) indicated that positive teacher-child interactions (TCI) are consistently associated with children's EF growth, and that this relationship is likely to be causal (Sankalaite et al., 2021). However, these reviews predominantly use data from North American and European samples and often fail to differentiate between TCI levels. Therefore, we set out to investigate in a meta-analysis whether the relationship between dyadic and classroom level TCI and EF is universal across cultures. Starting from a screening of 13,115 papers, 72 empirical studies from 16 cultural regions on the association between TCI and EFs were included. Using three-level meta-analytic models, it was found that overall TCI at both the dyadic and classroom level is related to EF, with effect sizes ranging from small (classroom-level) to medium effects (dyadic level). Moderation analyses suggest that this relationship is often stronger when using EF questionnaires compared to EF performance tasks. As for moderation by cultural parameters, our data showed that there is a stronger relation between closeness and EF for children from collectivistic cultures than individualistic cultures. Power distance moderated the relationship between instructional support and EF, with larger effect sizes found in participants from the large-power-distance societies. These cultural findings should be interpreted with caution as for other TCI-EF relationships, cultural differences proved to be an artefact of the EF instrument type being used.

Teacher-student relationships and psychosocial adjustment of students with learning disabilities
Keywords: Emotion and Affect, Learning and Developmental Disabilities, Primary Education, Social Aspects of Learning and Teaching
Presenting Author: Fotini Polychroni, NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS, Greece; **Co-Author:**Alexander-Stamatios Antoniou, National & Kapodestrian University of Athens, Greece; **Co-Author:**Evgenia Kyriakidou, National and Kapodistrian University of Athens, Greece; **Co-Author:**Despoina Kontaratou, National and Kapodistrian University of Athens, Greece

The aim of the present study is to explore students' with learning disabilities (LD) perceptions of psychosocial adjustment and their perceptions of teacher-student relationship as compared to their typical peers. Moreover, classroom teachers' perceptions of their quality of interaction with students were investigated.

The sample consisted of 400 5th and 6th grade primary school children aged 10 to 12 years. Of the sample, 46 students had a formal statement of learning disabilities by a state assessment centre or were rated as having difficulties in reading and writing by their teachers. The sample included also 24 primary school teachers teaching in these 8 schools in the children's respective classrooms who rated 107 students in terms of teacher-student quality (of those 45 students with LD). The Psychosocial Adjustment Questionnaire (Hatzichristou et al., 2008) and The Children's Appraisal of Teacher as a Secure Base Scale (Al-Yagon & Mikulincer, 2004) were administered to the students and the Student- Teacher Relationship Scale (Pianta, 2001) was administered to the teachers. Results showed that LD students reported significantly lower social adjustment, emotional adjustment, school adjustment, self-esteem and higher levels of behavior problems and teacher rejection as compared to their typical peers. Teachers' perceptions of closeness, conflict and dependency did not vary significantly between LD and typical students. Moreover, students' perceptions of teachers' availability and acceptance and existence of LD were positive predictors of social, emotional and school adjustment while the only significant positive predictor for students' behavior problems was students' perceptions of teachers' rejection.

Session G 20

23 August 2023 17:00 - 18:30
UOM_R08
Single Paper
Learning and Instructional Technology, Learning and Social Interaction, Learning and Special Education

Understanding and Supporting Students with Autism Spectrum Disorder

Keywords: At-risk Students, Computational Thinking, Educational Technologies, Immersive Technologies for Learning, In-service Teachers, Inclusive Education, Peer Interaction, Q-methodology, Secondary Education, Social Development, Social Interaction, Special Education, Teacher Professional Development
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 10 - Social Interaction in Learning and Instruction, SIG 15 - Special Educational Needs
Chairperson: Karsten Stegmann, University of Passau, Germany

The role of autistic traits in peer influence on social skills in special needs classrooms
Keywords: At-risk Students, Peer Interaction, Social Development, Special Education
Presenting Author: Gina Nenniger, University of Fribourg, Switzerland; **Co-Author:**Christoph Müller, University of Fribourg, Switzerland

Research on typical development indicates that the skill level among classmates influences individual skill development through processes such as social learning. Less is known on such classroom influence and the factors it depends on in students with an intellectual disability (ID). Since ID is often associated with autistic traits that may impede social learning, we examined in how far individual levels of autistic traits diminish classroom peer influence on social skills in students with ID. We used data collected at the beginning (T1) and end (T2) of a school year on 1,177 students with ID (29.7 % girls; *M* age = 11.26 years, *SD* = 3.76) attending 182 special needs classrooms. Information on students' social skills and autistic traits was reported by school staff. Results from multilevel analyses showed a significant interaction between individual autistic traits levels and classroom mean social skills at T1, predicting individual social skills at T2 (controlling for individual social skills at T1 and other variables). Our findings indicate that students with ID and higher autistic traits levels are less influenced by the peer context than students with ID and lower levels of autistic traits. Results are discussed in terms of the importance to support students with ID and high levels of autistic traits in learning from their peers at school.

Improving Computational Thinking for Children with Autism in the Virtual Environment
Keywords: Computational Thinking, Educational Technologies, Immersive Technologies for Learning, Special Education
Presenting Author: Nuodi Zhang, Florida State University, United States; **Co-Author:**Alex Barrett, Florida State University, United States; **Co-Author:**Fengfeng Ke, Florida State University, United States; **Co-Author:**Zlatko Sokolikj, Florida State University, United States; **Co-Author:**Jewoong Moon, The University of Alabama, United States

Computational thinking (CT) skills are fundamental 21st-century skills all students should acquire. The purpose of this study is to investigate the effectiveness of simulation design and coding activities in the virtual environment (VE) on learners' CT skill development. Two adolescents with autism participated in the study over a period of 10 to 15 months. A single subject design (A-B-A) was used with a 5-week baseline, a 19- to 29-week intervention, and a 2-week baseline. During the intervention, the participants were instructed to design and code a non-player character (NPC) for specific scenarios. The CT behaviors of the participants, including decomposition, abstraction, algorithmic thinking, evaluation, and generalization, were systematically coded based on an evidence-centered CT competency model. The results indicated that VE-based intervention is effective in improving CT skills for children with autism.

Inclusion of Children with Autism Spectrum Disorder in Portugal: A Social Network Analysis Approach
Keywords: At-risk Students, Inclusive Education, Social Development, Social Interaction
Presenting Author: Paulo César Dias, Universidade Catolica Portuguesa, Portugal; **Co-Author:**Ana Oliveira, Universidade Católica Portuguesa, Faculty of Philosophy and Social Sciences, Centre for Philosophical and Humanistic Studies, Portugal; **Co-Author:**Irene Cadime, Psychology Research Center, University of Minho, Braga, Portugal; **Co-Author:**Christoforos Mamas, University of California, San Diego, United States

Although most countries include inclusive education in their education policies to ensure the participation and inclusion of all students, research findings indicate that children with special education needs still face difficulties in social participation. This is the case of children with autism spectrum disorder (ASD), whose challenges in social skills create several barriers to their inclusion. In this regard, peer attitudes and behaviors are extremely important for creating and maintaining social networks and, consequently, for the inclusion of children with ASD in the classroom. The present study aims to describe the social participation of children with ASD, through a sociometric analysis and to analyze the perceptions of peers about inclusion. Two instruments were used to collect data: a sociodemographic questionnaire and the Social Networks Assessment Questionnaire. These were conducted on five classes of 3rd and 4th grade elementary school students in public schools in Portugal. The results show that the number of friends identified by students with ASD is similar to the number of friends identified by students without social needs. However, the results also suggested that children with ASD do not occupy central positions. Regarding the recreational network, the frequency of mentions decreased significantly. Moreover, in the help and conversation networks, most students with ASD were excluded. Regarding personal variables, a very low and negative correlation was perceived between age and "positive feelings towards school". The findings of this study suggest that improvements in inclusive education, intervention and attention to social participation of students with ASD are still needed.

What do secondary school teachers need to optimally educate students with Autism Spectrum Disorder?
Keywords: In-service Teachers, Q-methodology, Secondary Education, Teacher Professional Development
Presenting Author: Maria Fernanda Esqueda Villegas, University of Groningen, Netherlands; **Co-Author:**Steffie van der Steen, University of Groningen, Netherlands; **Co-Author:**Alexander Minnaert, University of Groningen, Netherlands

Teachers are essential in providing inclusive education to students with Autism Spectrum Disorder (ASD). Yet, little is known about what they need to optimally support this group of students in mainstream secondary education. The main goal of this study was to identify the needs of secondary school teachers when educating students with ASD in the Netherlands and Mexico (N=79). Using Q-methodology, we identified four groups of teachers with different needs in each country. The first group of Dutch teachers wanted ideas to improve the social skills of the student with ASD; the second group needed suggestions to improve the student's skills to deal with the mainstream environment; the third group wished to collaborate with other professionals and the fourth group of Dutch teachers needed advice on how to adjust their lessons. The first group of Mexican teachers wanted suggestions to structure and adapt their lessons; the second group not only needed help from other professionals but also to refresh their knowledge of ASD; a third group wanted to get ideas to improve the social skills of the student and the last group of Mexican teachers wanted more autonomy-support to know they were doing things right in their practice. Our findings revealed that teachers from the Netherlands and Mexico share some similarities regarding their needs to educate students with ASD. By acknowledging and meeting these needs, teachers might feel more confident in their interactions with this group of students who often struggle in mainstream school settings.

Session G 21

23 August 2023 17:00 - 18:30
UOM_R01
Poster Presentation
Higher Education, Learning and Instructional Technology, Learning and Social Interaction, Teaching and Teacher Education

Video-based Learning

Keywords: Cooperative/Collaborative Learning, E-learning/ Online Learning, Educational Technologies, Higher Education, Instructional Design, Multimedia Learning, Pre-service Teachers, Primary Education, Qualitative Methods, Secondary Education, Simulation-based Learning, Teacher Professional Development, Video-based Learning
Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 05 - Learning and Development in Early Childhood, SIG 06 - Instructional Design, SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Astrid Wichmann, Ruhr University Bochum, Germany

Fostering Pre-service Teachers' Assessment Skills: Establishing Adaptivity in a Video Simulation
Keywords: Educational Technologies, Pre-service Teachers, Simulation-based Learning, Teacher Professional Development
Presenting Author: Michael Nickl, Technical University of Munich (TUM), Germany

Novice teachers oftentimes struggle with the assessment of students' characteristics. To help building their assessment skills already in university-based teacher education, simulations including scaffolding have proven effective. Personalizing scaffolds in such simulations is expected to further increase learning gains. To empirically ground this kind of adaptivity in the context of pre-service teachers' assessment skills, we conducted two studies with $N = 150$ and $N = 108$ pre-service teachers in an already existing video-based simulation. In the first study, we aimed at investigating individual needs of pre-service teachers in the simulation by identifying profiles of their learner characteristics and the relation of the profiles to assessment skills. The three identified profiles reveal motivational and cognitive needs of pre-service teachers. For the second study, we thus evaluated the effects of cognitive and motivational scaffolding. We found that conceptual prompts (cognitive scaffolding) were helpful for learners with high motivational learner characteristics and learners with an average or low success expectancy. Learners with a high success expectancy benefitted most from a utility value intervention (motivational scaffolding). Concluding, an adaptive simulation for fostering pre-service teachers' assessment skills should take pre-service teachers' learner characteristics and their success expectancy into account to assign them adaptively to conceptual prompts or a utility value intervention. Further research may specify, how further types of scaffolding can be included in the simulation. This research gives an example on how adaptivity may be empirically grounded and established in learning environments.

VIPP-School: Feasibility of a video-feedback intervention to improve teacher-child interaction
Keywords: Primary Education, Qualitative Methods, Teacher Professional Development, Video-based Learning
Presenting Author:K.M. Starreveld, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Mathilde Overbeek, Vrije Uiniversiteit Amsterdam, Netherlands; **Co-Author:**Agnes Willemen, VU University Amsterdam, Netherlands; **Co-Author:**Marian Bakermans-Kranenburg, University Institute of Psychological, Social and Life Sciences, Portugal

Around the age of four most children find themselves in a new environment: primary school, where teachers start to play a key role in their lives. Longitudinal studies show that positive teacher-child relationships are associated with positive child functioning. The capacity of teachers to sensitively respond to the needs of children predicts positive interactions. However, teachers sometimes find it challenging to deal with children with behaviour problems. The Video-feedback Intervention to promote Positive Parenting and Sensitive Discipline (VIPP-SD) is proven to be effective in enhancing sensitive caregiving in different types of families and daycare settings. Given the effectiveness of VIPP-SD, we aim to test its potential for supporting teachers in interaction with children with challenging behaviour in their classroom (VIPP-School). In this qualitative study we investigated the feasibility of VIPP-School by analysing the perceptions of teachers and VIPP-interveners participating in VIPP-School. Results show that the participating teachers (n=3) noted the time investment, but appreciated the

video fragments as a great mean to become more aware of small signals of the child and their own behaviour. VIPP-School has potential for supporting teachers in the interaction with their children with challenging behavioural and creating more positive teacher-child relationships. Currently, we are testing VIPP-School in a randomized controlled trial. *Keywords:* Qualitative methods, Teacher professional development, Video-based learning, Primary education

Multimedia principles in instructional videos for classroom: A case study with pre-service teachers
Keywords: Multimedia Learning, Pre-service Teachers, Qualitative Methods, Video-based Learning
Presenting Author: Juliette Desiron, University of Zürich, Switzerland; **Co-Author:**Eliana Brianza, University of Zurich, Institute of Education, Switzerland

Multimedia learning is a component of almost every teaching and learning setting and the literature describes well-established design principles at its base. Nevertheless, at present teachers frequently appear to have misconceptions related to multimedia learning and few studies have investigated the implementation of these principles in authentic materials. This study investigated nine preservice teachers attending a course on multimedia learning in videos and examined the effects of the course on their understanding and implementation of multimedia learning principles in instructional videos. Preliminary analyses show that with regards to their multimedia learning misconceptions assessed at the beginning of the semester, preservice teachers appear to be less secure in the extent to which they agree with multimedia statements but more secure in aspects with which they disagree. Initial coding of a subsample of videos (n = 21 out of 49) selected by preservice teachers for their teaching subject found a predominant presence of effective use of the signaling principle whereas segmentation and the coherence principle appeared to be more frequently misalignment with multimedia learning recommendations. Further analyses on multimedia learning principles will be carried out on the remaining 28 videos and the findings will be discussed in relation to the potential of developing preservice teachers' multimedia learning expertise through teacher education.

Effects of quizzes on (self-regulated) learning when studying instructional videos
Keywords: E-learning/ Online Learning, Higher Education, Instructional Design, Video-based Learning
Presenting Author: Margot van Wermeskerken, Utrecht University, Netherlands; **Co-Author:**Floor van Rosse, Erasmus MC Rotterdam, Netherlands

Blending traditional face-to-face and web-based learning has been shown to be very effective for learning – at least if students come to face-to-face meetings well-prepared. However, this is not always the case presumably because students overestimate their own learning when studying educational videos. One possible solution is to integrate a form of retrieval practice (i.e., quizzes) in online educational videos. Performance on these quizzes is expected to reveal students' knowledge gaps which helps them to monitor their learning process and regulate it accordingly.In a blended course of medicine, 168 master students were either assigned to a quiz or no quiz condition. During this 7-week-course, students were weekly presented with educational videos on drugs with/without a quiz prior to each face-to-face meeting. At the end of the course, formative test performance and exam performance were compared between the *quiz* and *no quiz* conditions. SRL ratings at the start and end of the course were compared between conditions.Although drop-out was substantial, the results indicate that integrating quizzes fostered students' learning as indicated by higher performance on the formative test at the end of the course compared to students in the no-quiz condition. Exam performance and SRL ratings did not differ between conditions. Although promising, this study calls for more applied research to replicate the current findings including larger samples.

Effects of collaborative reception of explanatory videos on knowledge and competencies
Keywords: Cooperative/Collaborative Learning, Multimedia Learning, Secondary Education, Video-based Learning
Presenting Author: Laura Schultze, Universität Hildesheim, Germany; **Co-Author:**Raphael Koßmann, Universität Hildesheim, Germany; **Co-Author:**Nicoletta Bürger, University of Hildesheim, Germany; **Co-Author:**Melanie Fabel-Lamla, Universität Hildesheim, Germany; **Co-Author:**Christof Wecker, Universität Hildesheim, Germany

Explanatory video plays a substantial role in many adolescents' informal learning experiences. While the flipped classroom format in which the students prepare an in-class lesson at home by watching videos individually has been the subject of a substantial body of research, the question of how explanatory video can be employed effectively in the classroom itself has not been answered systematically yet. Research on multimedia learning focuses on the design of instructional videos in order to reduce cognitive load and foster meaningful learning activities. A complementary approach in a classroom setting might be the collaborative reception of explanatory videos supported by collaboration scripts. Following these considerations, the study presented on this poster investigates to what extent the collaborative reception of explanatory videos supported by a collaboration script has an effect on the acquisition of content knowledge and collaborative competencies. A quasi-experimental intervention study with a pre-post control group design is conducted in a lesson in two English as a foreign language classes at a secondary school. The unit contains two explanatory videos. In the control group, the students work on the videos individually. In the experimental group, the students work in pairs; their interaction is structured by means of worksheets. Content knowledge and collaborative competencies are assessed by means of open-ended and single-choice questions in the pre- and post-tests. The study promises insights about possibilities to promote the effective reception of explanatory videos in classroom settings.

Session G 22

23 August 2023 17:00 - 18:30
UOM_R02
Poster Presentation
Cognitive Science, Culture, Morality, Religion and Education, Learning and Instructional Technology, Teaching and Teacher Education

Fostering Argumentative Processes and Skills

Keywords: Argumentation, Art Education, Citizenship Education, Cognitive Skills and Processes, Cooperative/Collaborative Learning, Creativity/Divergent Thinking, Critical Thinking, Instructional Design, Knowledge Construction, L1/Standard Language Acquisition, Learning Approaches, Secondary Education, Social Interaction, Writing/Literacy
Interest group: SIG 12 - Writing, SIG 13 - Moral and Democratic Education, SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: SOFIA AVGITIDOU, Aristotle University of Thessaloniki, Greece

Learning genre knowledge from comparing argumentative texts: zooming in on the comparison processes
Keywords: Argumentation, Knowledge Construction, Secondary Education, Writing/Literacy
Presenting Author: Tine Mombaers, University of Antwerp, Belgium; **Co-Author:**Roos Van Gasse, University of Antwerp, Belgium; **Co-Author:**Sven De Maeyer, Antwerp University, Belgium

Argumentative writing skills are paramount for students' academic and occupational success. But students struggle with writing a good argumentative text. Enhancing students' genre knowledge can help overcome students' difficulties. A recent study on enhancing genre knowledge of argumentative texts through (comparing) exemplars showed some discrepancies with literature. First, looking for differences seems less effective than searching for similarities. Second, learning from comparing exemplars does not increase genre knowledge more than learning from single, sequential exemplars. This study aims to explain these discrepancies by looking at the 10% highest (responders) and lowest raisers (non-responders to treatment) regarding genre knowledge. Through a qualitative exploration, their learning processes will be investigated in depth.

Personal Relevance and Refutation: Fostering High School Students' Argument-Evaluation Skills
Keywords: Argumentation, Citizenship Education, Instructional Design, Secondary Education
Presenting Author: Nina Udvardi-Lakos, University of Freiburg, Germany; **Co-Author:**Tino Endres, University of Freiburg, Germany; **Co-Author:**Laura Wevelsiep, University of Freiburg, Germany; **Co-Author:**Lisa Bender, University of Freiburg, Germany; **Co-Author:**Alexander Renkl, University of Freiburg, Germany

Young adults in democratic societies should know how to evaluate political arguments to form their own decision and decide which parties and politicians to vote for. However, studies show that many people show low ability for argument evaluation and adhere to false concepts in this respect. As citizens of many countries

can vote once they are 18 years old, high school seems to be an important place to foster argument evaluation skills before young adults cast their first votes. We developed a learning intervention meant to foster the use of formal criteria for argument evaluation and to reduce adherence to false concepts. These aspects were addressed using emotional design videos. We used a 2x2 between-subjects design, experimentally varying the presence of personal relevance prompts and refutation components. Personal relevance prompts should increase learners' motivation for and subsequent effort invested in the learning materials. Refutation components should decrease the adherence to false concepts. We will implement this intervention with approximately 128 high school students in Spring 2023. We expect that participants who receive refutation components will show lower adherence to false concepts than participants who did not receive refutation components; and that participants who receive personal relevance prompts before the videos will show higher learning gains compared to participants who receive the personal relevance prompts at the end of the study. This pattern of results would suggest that our intervention is an efficient approach to fostering skills that young adults will need to play their role in democratic societies.

Opening the black box of students' argumentative writing processes
Keywords: Argumentation, Cognitive Skills and Processes, Secondary Education, Writing/Literacy
Presenting Author: Fien De Smedt, Ghent University, Belgium; **Co-Author:**Nina Vandermeulen, Umeå University, Sweden; **Co-Author:**Yana Landrieu, Ghent University, Belgium; **Co-Author:**Bram De Wever, Ghent University, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium

The current study aims to uncover students' actual approach during writing an argumentative text based on two source texts. More particularly, we aim to study the occurrence of particular reading and writing processes and the temporal patterns between these processes. Furthermore, we aim to uncover how these processes relate to students' argumentative writing performance. In total, 37 eleventh-grade students individually wrote an argumentative text and their keystrokes as well as their screens were captured. Furthermore, the text quality of students' written texts were evaluated using comparative judgement. Currently, preparatory analyses based on the keystroke log and screen data are conducted. In a next phase, educational process mining will be applied on the keystroke log data to visualize students' writing behavior to facilitate a thorough understanding of the course of students' complex real-time writing processes.

Reclaiming habit formation for democratic values in schools: practicing and experiencing citizenship
Keywords: Argumentation, Citizenship Education, Critical Thinking, Social Interaction
Presenting Author: Gabriel Fortes, Universidad Alberto Hurtado, Chile; **Co-Author:**Andreas Reichelt Lind, OsloMet - Oslo Metropolitan University, Norway; **Co-Author:**Antonia Larrain, Universidad Alberto Hurtado, Chile

Many citizens in democracies are growing increasingly disillusioned with their governments' efforts to actively promote and endorse democratic values. There is a lack of public trust in institutions, and a declining willingness to participate in public life. The trend seems to be most pronounced in countries where participation is low, and the democratic process is being constantly challenged. Students are experiencing uncertainty and doubt about the future, and they are not equipped with the critical thinking skills they need to engage critically with the democratic process. We problematize, that even in places where students are knowledgeable related to citizenship and democracy, the general experience they are exposed to is of distrust of democratic values and public decision-making. Reclaiming Dewey's argument for habit formation and his ideas of practicing and experiencing democracy we argue that citizenship education should be centered around designing spaces for the exercise of democratic deliberation. Further, through a discussion of argumentation literature, we suggest how to promote habits of critical thinking, participation, and informed decision-making through collaborative deliberation. We argue that to address the challenges of uncertainty the future generations have with climate change, rise of polarization, fake news, and many other social issues, experiencing and practices of deliberation will be key. In this sense, providing young people with opportunities to engage in democratic experiences and supporting formation of democratic habits, we can help them to become more civically engaged citizens.

Dealing with conflicting sources in argumentative writing and its consequences
Keywords: Argumentation, Cognitive Skills and Processes, L1/Standard Language Acquisition, Writing/Literacy
Presenting Author: Hyeyoun Kim, Dongguk University-Seoul, Republic of Korea; **Co-Author:**Gyeonghoon Yoon, High School Attached to College of Education, Dongguk University, Republic of Korea

Use of various sources that support competing views during argumentative writing has been addressed less than its importance. The current study thus aims to investigate the relations between the use of sources supporting conflicting views during undergraduate students' source-based argumentative writing and their writing performance. To this end, 75 undergraduate students wrote an argumentative essay based on two conflicting sources and filled out questionnaires about their perspectives on writing and awareness on the writing performance. Writing process and source use data were collected through Inputlog. Participants' writing outputs were both holistically and analytically scored. As a preliminary result, undergraduate writers who spent less time in reading the task description and sources for writing tended to write better instruction. In addition, writers who read the two conflicting sources in a balanced way tended to produce stronger and organized arguments and showed more interest in the task. The educational implications for the source use in argumentative writing were drawn from the results.

Stories of Crises in Art: A Potential for Democratic Education?
Keywords: Art Education, Citizenship Education, Creativity/Divergent Thinking, Learning Approaches
Presenting Author: Britta Breser, University of Vienna & University of Graz, Austria

Art that visually addresses social order and political events increasingly focuses on crises. As a report on everyday social life or a chronicle of political events, art has always told stories of other realities in a reflective mode, illustrated their disruptions and contrasted hegemonic constructions of reality. In this presentation, stories of crises in art will be critically examined as a potential space for democratic educational processes: Based on the panorama video installation "More sweetly play the dance" (Bloemheuvel/Guldemond 2015), in which the South African artist William Kentridge did not refers to a hoped-for or expected state after the crisis, but to the presence in the crisis, this presentation addresses stories of art from the perspective of democratic education in their constitutive ambivalence. Democratic possibilities of educational processes with visual stories of crises are highlighted.

Dialogue and critical questions to promote critical thinking in Secondary Education students
Keywords: Argumentation, Cooperative/Collaborative Learning, Critical Thinking, Secondary Education
Presenting Author: Jose Luna, University of Barcelona, Spain; **Co-Author:**Núria Castells, Faculty of Psychology, University of Barcelona, Spain; **Co-Author:**Esther Pérez, Universitat de Barcelona, Spain; **Co-Author:**Marta Minguela, University of Barcelona, Spain; **Co-Author:**Amelia Tey, Universitat de Barcelona, Spain

One of the most relevant competences for the 21st century that schools should promote is critical thinking. In collaborative tasks, dialogue is crucial for arguing and developing critical thinking is dialogue. However, students may be uncritical and accept misleading information when they discuss. Asking students to solve critical questions, either individually or while engaged in dyadic dialogue, has shown that it helps students to focus on assessing the arguments orally. The main aim of this study is to assess the impact of including a dyadic dialogue and/or critical questions in the number of arguments students include in their texts. 53 secondary school students participated in this study. They were assigned to one of the three experimental conditions: critical questions (CQ); dialogue (D), and dialogue and critical question condition (DCQ). First they answered a reading comprehension test. Then, they had to read two news that included arguments in favour or against school segregation, and write an argumentative text on this topic individually. After this, students in CQ answered critical questions before rewriting the text individually. Students in the D condition discussed the source texts in pairs and rewrote the argumentative text individually. Dyads in the DCQ solved critical questions and were asked to rewrite their initial text individually. While the experimental condition has no significant impact in the number of arguments included either in the first or the second version of the texts, participants in the D and DCQ conditions included fewer arguments in favour of segregation in their second text.

Session G 23

23 August 2023 17:00 - 18:30
UOM_R03

Poster Presentation
Assessment and Evaluation, Educational Policy and Systems, Higher Education, Learning and Social Interaction, Learning and Special Education, Teaching and Teacher Education

Inclusive Education and Learning

Keywords: Achievement, Assessment Methods, Classroom Assessment, Cultural Diversity in School, E-learning/ Online Learning, Educational Policy, Goal Orientations, Higher Education, Inclusive Education, Migrant / Refugee and Minority students, Mixed-method Research, Pandemic, Primary Education, Secondary Education, Social Aspects of Learning and Teaching, Social Interaction, Special Education, Teaching Approaches, Teaching/Instructional Strategies, Well-being
Interest group: SIG 04 - Higher Education, SIG 10 - Social Interaction in Learning and Instruction, SIG 15 - Special Educational Needs, SIG 18 - Educational Effectiveness and Improvement, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: LEFKOTHEA KARTASIDOU, Greece

Domain-specificity and domain-generality in teaching sensitive and controversial issues
Keywords: Cultural Diversity in School, Secondary Education, Social Aspects of Learning and Teaching, Teaching Approaches
Presenting Author: Machteld Vandecandelaere, KU Leuven, Belgium; **Co-Author:**Rushda Kaleem, KU Leuven (BE), Belgium; **Co-Author:**Cato Teughels, KU Leuven (BE), Belgium; **Co-Author:**Nafen Zhuo, KU Leuven (BE), Belgium; **Co-Author:**Jan Sermeus, KU Leuven, Royal Observatory of Belgium, Belgium

Teachers around the world are faced with teaching sensitive and controversial issues (SCIs). While SCI's are not new, tension within classrooms increases with increased diversity in the classroom and with raised critical consciousness and activism in society (i.e., wokeness).
Research on SCIs is fragmented across disciplines. Exchange between disciplines however has the potential to provide a basis for future research and professional development. A common language, captured within an interdisciplinary framework is therefore indispensable. By means of a systematic review and interviews with teachers in soft and hard science education, we address this lack by mapping the diversity of SCIs that teachers are confronted with in secondary education, covering content in both soft and hard sciences.
The systematic review demonstrated a diverse range of topics spread more or less evenly between hard and soft disciplinary groups. Of these, topics are more concentrated in pure disciplines than applied. For the interviews with 8 teachers, we hypothesize the domain-specificity and domain-generality to be related to dimensions of Biglan's (1973) classification of disciplines. Overall, the results from this study will allow contacts to be made and research collaborations to be promoted between school subjects and disciplines and across countries.

Evaluation of a Pilot School-Based Teacher-Coaching intervention to change the social climate
Keywords: Achievement, Classroom Assessment, Inclusive Education, Social Interaction
Presenting Author: Carina Wikman, Stockholm University, Department of Special Education, Sweden; **Co-Author:**Mara Westling Allodi, Stockholm University, Sweden; **Co-Author:**Laura Ferrer-Wreder, Stockholm University, Department of Psychology, Sweden

Evaluation of a Pilot School-Based Teacher-Coaching intervention to change the social climate in Second Grade Carina Wikman, Mara Westling Allodi, and Laura Ferrer-Wreder. Abstract: The structure of relationships in the classroom and what is proceeding socio-emotionally in the learning environment may hinder or support children´s learning and development. Therefore, measuring the social climate is essential to identify challenges, successes, and areas for additional improvement. The present study examined the effect of a practice-based coaching intervention in improving the social climate in the learning environment and academic achievement and behavioral outcomes for students. The design was experimental with a cluster randomized assignment. Eligibility criteria for participants and clusters were 1) municipal primary schools, 2) second-grade classes 3) teacher certification. Intervention pertains to the cluster level: classes were *N*= 4 and students *N*=66, Wait-list-control group: classes were *N*= 4 and students *N*= 77. The duration of the intervention was eight months. It consisted of three key components: action planning, observation, and professional conversation, accordingly to the Practice Based Coaching model. The overall aim of the present study was to develop and test the effects of the intervention that involves the introduction of activities, self-assessment, observation, and coaching aimed at beneficially changing the social climate in the classroom, with a hypothesized indirect impact on students´ self-concept, prosocial behavior, well-being, and academic achievement.

Reference norm orientations of teachers and characteristics of professional contexts
Keywords: Assessment Methods, Goal Orientations, Inclusive Education, Teaching/Instructional Strategies
Presenting Author: Josephine Tanneberger, University of Potsdam, Germany; **Co-Author:**Jessica Jaeuthe, Universität Potsdam, Germany; **Co-Author:**Sebastian Kempert, University of Potsdam, Germany; **Co-Author:**Nadine Spörer, University of Potsdam, Germany

Teachers' reference norm orientations play an important role in describing and explaining student performance assessment practices in German classrooms. So far, research has mainly focused on the effects of different reference norm orientations on students' learning processes and outcomes. However, what influences the choice of reference norms in the classroom is largely unknown. In order to obtain first indications of which aspects turn out to be important for teachers' choice of reference norms, this contribution addresses the question of associations between reference norm-specific teacher groupings and individual characteristics of the professional context. To this end, *N = 2763* teachers from inclusive schools in Germany are grouped via latent profile analyses (LPA) according to their reference norm choice in different assessment contexts. Subsequently, correlation structures between the groups of teachers and the characteristics of *access to teaching profession*, *professional function*, *school type*, and *working hours* are statistically tested. The central findings, possible limitations as well es implications for pedagogical practices will be discussed.

Online studying with special needs - a student perspective
Keywords: E-learning/ Online Learning, Higher Education, Inclusive Education, Mixed-method Research
Presenting Author: Maria Öhrstedt, Stockholm University, Sweden; **Presenting Author:**Annika Käck, Stockholm University, Sweden; **Co-Author:**Helena Reierstam, Stockholm University, Sweden

The Covid-19 pandemic forced many universities to rapidly transition into remote online teaching, which of course had implications for students that attend and study in Higher Education. However, there is still a lack of research on how the students themselves perceive these online learning environments. This study aims to reveal and compare how students with and without disabilities perceived online learning. The data collection draws from a survey with both quantitative and qualitative questions, conducted among Swedish university students (N=6156 students, whereof 430 were students with disabilities, SWD) in late spring 2021. The results indicate that SWD preferred online learning over onsite learning in certain aspects, with better opportunities to focus, less distractions and less energy thieves as the students could work from home. Some SWD expressed that online teaching minimized disabilities and that the technology provided scaffolds. Barriers on the other hand were identified as lack of communication and insufficient instructions from the teachers, the teachers' lack of technological pedagogical knowledge, and students' lack of motivation and managerial skills. Based on the findings we propose a need to consider both the benefits and the challenges as Higher Education embraces inclusive online learning, to improve teaching and learning with all students in mind. SWD requested more transparent course designs, more interactions with peers and teachers, and inclusive online behaviour.

Case study: Students' emotional well-being and social participation with focus on SEN during COVID19
Keywords: Inclusive Education, Pandemic, Social Interaction, Well-being
Presenting Author: Alexandra Pirker, University of Vienna, Austria; **Co-Author:**Katharina-Theresa Lindner, University of Vienna, Austria

Research indicates that emotional well-being is an important factor for social participation in the school context (Blumenthal & Blumenthal, 2021). Furthermore, social participation is seen as a key element for students' self- perceived inclusions (Schwab & Alnahdi, 2020). For students with special educational needs (SEN), some studies have found that they have a lower level of emotional well-being (e.g. McCoy & Banks, 2012; Skrzypiec et al., 2016), while others have not found a group difference compared to peers without SEN (Schwab et al., 2015). For social participation, students with SEN research consistently show that students with SEN are at risk of low social participation (Schwab, 2018). Within the current case study, students' emotional well-being and social participation

was investigated during the period of the COVID-19 pandemic. Two 4th graders with SEN and two without SEN participated in the photovoice project. Photovoice belongs to the participatory action research approach and is often used for participants with limited power (Wang & Burris, 1997). Moreover, semi-structured interviews with the participants have been conducted and analyzed according to the Qualitative Content Analysis (Mayring, 2021). The results point towards fairly similar experiences of emotional well-being and social participation of students with and without SEN. Spaces like the school yard have been identified as highly important places for social interaction during the COVID-19 period. Generally, the pandemic was addressed as an exclusively negative experience by the students and in this context referred only to hygienic measures and regulations implemented in the school (e.g. mandatory face masks).

Social Inclusion in Secondary School
Keywords: Inclusive Education, Pandemic, Social Aspects of Learning and Teaching, Special Education
Presenting Author: Reto Luder, Zurich University of Teacher Education, Switzerland; **Co-Author:**Andre Kunz, Zurich University of Teacher Education, Switzerland; **Co-Author:**Giuliana Pastore, Zurich University of Teacher Education, Switzerland; **Co-Author:**Ariane Paccaud, Pädagogische Hochschule Zürich, Switzerland

At present, school systems are shifting towards inclusive support for children with special educational needs (SEN). In order to feel socially included, students should experience schools as reliable places of learning and support. Particularly adolescents with SEN at lower secondary school level are at risk of being socially excluded and of developing a lower academic self-concept. The research questions of the present study aim at the situation of children with SEN in the transition from primary to lower secondary school in Switzerland, focusing on their social inclusion.The study conducts a multi method, longitudinal design, analyzing data from pupils with SEN (N=49), their peers (N=584), as well as their parents and teachers. Quantitative data was collected using a questionnaire with standardized scales as well as sociometric data. The qualitative data was collected by semi-structured interviews.Results show that differences in social status and perception of inclusion as well as in the mutual development of these two aspects during the three years of secondary school are strongly influenced by the SEN-status of the students.

Education Accessibility in Challenging Circumstances: A Case of Displaced Persons in Nigeria.
Keywords: Educational Policy, Inclusive Education, Migrant / Refugee and Minority students, Primary Education
Presenting Author: Vivienne Kachollom Rwang, University of Southampton, United Kingdom

In Nigeria, forced displacements due to protracted conflicts have disrupted schooling, leaving some children confined in camps and most displaced children without access to any form of education. Educational deficits have however, remained prevalent in Central/Northern Nigeria precisely, owing to protracted insurgencies by Boko Haram and Fulani herdsmen, causing displacement of millions, primary age children comprising the larger percentage. This situation has adversely affected education quality and equitability, resulting to high levels of marginalisation and educational displacements. This paper aims to shine the light on Nigeria's basic education policy and its practice to examine its implementation as it relates to accessibility for displaced children who reside in IDP camps. A case study of some IDP camps in North-Central and North-East Nigeria was adopted, using qualitative methods of data collection to answer the research question. Data instruments included individual and focus-group interviews and document review. Data was drawn from three IDP camps, one neighbouring school and from the State Universal Basic Education Board (SUBEB); two policy makers, three camp managers, three camp teachers, two neighbouring schoolteachers and twenty displaced children. Data collected was transcribed, coded, and analysed thematically. The findings revealed that the reality on ground is at variance with policy statements. Although the children expressed optimism in their desire for education, viewing it as a means for a bright future, lack of accessibility, rejection or demand for huge tuition/levies by neighbouring schools in some instances, have remained impediments to the children's desires.Displacement, Policy, Education, Accessibility

Session G 24

23 August 2023 17:00 - 18:30
UOM_GYM
Roundtable
Culture, Morality, Religion and Education, Lifelong Learning

Religion, Spirituality and Worldviews

Keywords: Attitudes and Beliefs, Competencies, Conceptual Change, Cultural Diversity in School, Knowledge Construction, Lifelong Learning, Mixed-method Research, Qualitative Methods, Quantitative Methods, Reading, Religiosity and Spirituality, Secondary Education
Interest group: SIG 19 - Religions and Worldviews in Education
Chairperson: Petra Juen, Austria

Learning to judge religious conflicts: A structural model of judgement competence for RE
Keywords: Competencies, Quantitative Methods, Religiosity and Spirituality, Secondary Education
Presenting Author: Frederike Gabelt, TU Dortmund University, Germany

In times of increasing polarisation, the ability to judge is growing in relevance. Judgement competence is, therefore, one of the key competencies that students at German schools should develop. However, in didactics and official school requirements for RE in Germany, it has so far not been clearly defined what is to be learned and tested in terms of judgement competence. Moreover, there has been limited research on how such competence can be empirically measured. This study aims to elucidate the process of religious judgement of students and to identify factors, e.g. knowledge and motivation, that influences this process. For this purpose, a structural model of students' religious judgement competence has been developed, which will be empirically validated. The results are intended to contribute to elaborating suitable didactic measures to foster the religious judgement competence of students.

Historical narratives among students and their meaning-making function
Keywords: Attitudes and Beliefs, Cultural Diversity in School, Qualitative Methods, Secondary Education
Presenting Author:G.M. Gaans, University of Amsterdam, Netherlands

People use narratives to give meaning to life by connecting present, past and future in a meaningful way. These narratives are studied from various disciplines, including history and religious studies. Insights from both disciplines are rarely combined. This research project explores the possibility of using strategies from spiritual care to uncover the meaning-making layer of stories students tell about the shared past. Using newly designed data collection tools, students explicate their narratives about a shared past. These narratives are analysed qualitatively to characterize and understand the way in which they give meaning and how they help the students to orientate themselves in their lives and towards their future. The designed methods were applied among high-school students of 15 and 16 years old. The analysis showed that students with a more explicit social self-identification used more coherent narratives about the past and connected these to their core values and foundational views of people and world. Because of the latter connection, these stories also have meaning. These insights may help to better understand the sensitive nature of some historical topics in classroom situations.

What is religious literacy? A delphi study design on Finnish academic experts' perceptions.
Keywords: Competencies, Conceptual Change, Qualitative Methods, Religiosity and Spirituality
Presenting Author: Martin Ubani, University of Eastern Finland, Finland

I aim to present a research design of a starting research. The purpose of this study is to develop a conceptual model of religious literacy (RL) for understanding conceptions about religion. The main research question in this study is: "How does academia conceptualise and theorize RL today?" This includes four sub-questions:a) What is RL?b) What are the key threshold concepts and key domains of RL?c) What are the boundaries of the concept of RL?d) How can RL be distinguished from overlapping skills/concepts?The Delphi method (DM) is used for data gathering. The data will be collected from 25 scholars. DM is an iterative method aiming at a consensus outcome by "eliciting and refining group judgments" from a group of experts on a studied topic (Dalkey, Brown & Cochran 1969). The DM typically has many rounds and uses empirical data-gathering methods. The study employs Grounded theory (GT) as the data analysis

method.

Preparing upper-secondary school students for higher education with emphasis on academic literacy
Keywords: Knowledge Construction, Lifelong Learning, Mixed-method Research, Reading
Presenting Author: Tonje Stenseth, University of South-Eastern Norway, Norway; **Presenting Author:**Liv Lofthus, University of southeastern Norway, Norway

We live in a time characterized by major changes, where the diversity of information offered is enormous, and at times very unclear. Consequently, such changes has huge implications for knowledge acquisition and production, with individuals' literacy skills becoming core competences. Against this background, we want to address two key challenges in the current study: the development of academic literacy in upper-secondary school students with a particular focus on reading, as well as the transition between upper-secondary school and higher education. Our aim is to better equip students in upper-secondary school to meet the complex text and knowledge culture in higher education by fostering their academic literacy skills and hopefully reducing the gap between these two education levels.

Session G 25

23 August 2023 17:00 - 18:30
UOM_A04
Workshop
Assessment and Evaluation

Evaluating quality of assessment in higher education with the online Assessment Web tool

Keywords: Assessment Methods, Educational Technologies, Higher Education, Tool Development
Interest group: SIG 01 - Assessment and Evaluation

Quality of assessment is increasingly approached from a more holistic perspective, in which assessment quality implies more than assuring quality on the assessment level. To analyze quality of assessment as a whole five entities should be distinguished: assessment (tasks), assessment program, assessment policy, assessment organization and assessment literacy. To provide educational practitioners with tools which help them to determine, improve and maintain assessment quality as a whole and on each entity, the assessment web and a self-evaluation method were designed. Research was conducted to establish whether the assessment web is understandable and complete, and the web and the self-evaluation method are usable for determining, improving and maintaining quality of assessment. In the workshop the re-design of the assessment web and the design of the online Assessment Web tool will be presented.

Evaluating quality of assessment in higher education with the online Assessment Web tool
Presenting Author: Tamara Schilt-Mol, Hogeschool van Arnhem en Nijmegen, Netherlands; **Presenting Author:**Eline den Tuinder, HAN University of Applied Sciences, Netherlands; **Presenting Author:**Marion van de Wijdeven, HAN University of Applied Sciences, Netherlands; **Co-Author:**Edwin Buijs, HAN University of Applied Sciences, Netherlands; **Co-Author:**Kyle Van den Langenberg, HAN University Nijmegen, Netherlands; **Co-Author:**Marjoleine Dobbelaer, HAN University Nijmegen, Netherlands; **Co-Author:**Linda Jakobs, HAN University of Applied Sciences (UAS), Netherlands; **Co-Author:**Sharon Klinkenberg, University of Amsterdam, Netherlands

Quality of assessment is increasingly approached from a more holistic perspective, in which assessment quality implies more than assuring quality on the assessment level. To analyze quality of assessment as a whole five entities should be distinguished: assessment (tasks), assessment program, assessment policy, assessment organization and assessment literacy. To provide educational practitioners with tools which help them to determine, improve and maintain assessment quality as a whole and on each entity, the assessment web and a self-evaluation method were designed. Research was conducted to establish whether the assessment web is understandable and complete, and the web and the self-evaluation method are usable for determining, improving and maintaining quality of assessment. In the workshop the re-design of the assessment web and the design of the online Assessment Web tool will be presented.

Session G 26

23 August 2023 17:00 - 18:30
UOM_A05
ICT Demonstration
Learning and Instructional Technology

AI-supported acquisition of argumentation skills: the 'Argueniser'

Keywords: Artificial Intelligence, Computer-supported Collaborative Learning, Peer Interaction, Tool Development
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Please bring your own device if you are attending this ICT demonstration.Over the last decades, student enrollment at universities has increased, while capacities – above all in terms of teachers – to support their learning are limited. Especially for improving argumentation skills, individual feedback is important. How can universities bridge this growing gap? We present a teaching tool for an AI-supported learning scenario. It aims to achieve high learning effectiveness within strictly defined subject areas: supporting the acquisition of argumentation competence in the disciplines of Economics and Law. It enables individual feedback for large audiences and interaction in online learning environments. The tool implements a scaffolding exercise: Students are aided by a predefined argumentation scheme in writing an answer to an open question. They receive feedback from their peers and an artificial intelligence (AI) for each respective argumentation element. Further, the tool integrates this exercise within the larger context of the class. The tool is part of an interdisciplinary project training an AI in the areas of Economics and Law. Both student answers and peer reviews are being used as training data, indicating the tool's notable double purpose of teaching students and an AI simultaneously.

AI-supported acquisition of argumentation skills: the 'Argueniser'
Presenting Author: Stephan Geschwind, University of Passau, Germany; **Presenting Author:**Deborah Voss, University of Passau, Germany; **Co-Author:**Veronika Hackl, Universität Passau, Germany

Please bring your own device if you are attending this ICT demonstration.Over the last decades, student enrollment at universities has increased, while capacities – above all in terms of teachers – to support their learning are limited. Especially for improving argumentation skills, individual feedback is important. How can universities bridge this growing gap? We present a teaching tool for an AI-supported learning scenario. It aims to achieve high learning effectiveness within strictly defined subject areas: supporting the acquisition of argumentation competence in the disciplines of Economics and Law. It enables individual feedback for large audiences and interaction in online learning environments. The tool implements a scaffolding exercise: Students are aided by a predefined argumentation scheme in writing an answer to an open question. They receive feedback from their peers and an artificial intelligence (AI) for each respective argumentation element. Further, the tool integrates this exercise within the larger context of the class. The tool is part of an interdisciplinary project training an AI in the areas of Economics and Law. Both student answers and peer reviews are being used as training data, indicating the tool's notable double purpose of teaching students and an AI simultaneously.

Session H 1

24 August 2023 08:00 - 09:30
HELEXPO_CC

Invited Symposium
Developmental Aspects of Instruction, Learning and Instructional Technology, Learning and Social Interaction

From Access to Impact: A Quality Perspective on Early Childhood Digital Education

Keywords: Creativity/Divergent Thinking, Digital Literacy and Learning, Early Childhood Education, Educational Technologies, Engagement, Foreign and Second Language Acquisition, Social Interaction
Interest group: SIG 05 - Learning and Development in Early Childhood
Chairperson: Franziska Cohen, University of Education Freiburg , Germany
Organiser: Franziska Cohen, University of Education Freiburg , Germany
Discussant: Yvonne Anders, Otto-Friedrich-University of Bamberg, Germany

One of the most significant changes in recent years is the expansion of information and communication technology (ICT) and widespread digitization in society. This has had a significant impact on the early childhood education and care (ECEC) system, as children are exposed to ICT at an early age in their family environments (Grassland, 2018). As ECEC settings are a crucial environment for children's learning and development, it is essential to address the challenges and harness the potential of ICT to promote children's development and well-being.However, it is important to note that although the use of ICT is closely linked to learning, there is no necessary correlation between access to technologies, children's usage patterns, and the impact on children in family and educational contexts. Therefore, it is crucial to consider what constitutes "good practice" in digital education.
Questions such as how pedagogical quality can be related to digital learning environments, particularly in regards to interactions in ECE settings and the family, and how they affect the use of ICT, as well as what features enable ICT to become a tool for promoting children's learning and well-being are crucial to address. The contributions in the symposium will address these questions from interdisciplinary research perspectives, with an integrative discussion ultimately serving as the starting point for further insights into how high-quality early digital education can be achieved.

How can guided pretend play contribute to the quality of digital education in early childhood?
Presenting Author: Franziska Vogt, St.Gallen University of Teacher Education, Switzerland; **Co-Author:**Lena Hollenstein, University of Teacher Education St.Gallen, Switzerland

How can high-quality digital education be implemented (Cohen & Hemmerich, 2019)? Often curricula focus on competencies for using digital media and on specific aspects of computer science such as coding (i.e. Friedrichs-Liesenkötter, 2019; Lienau & van Roessel, 2019). Competencies such as a basic understanding of developing digital technologies, as well as their production and repair, or questions around artificial intelligence, have received little attention in early childhood education so far.The following research questions are examined: (I) Which areas of early digital education are encouraged with the pretend play impulses? (II) In what ways do early childhood educators support the pretend play of children and foster digital competencies?In the framework of the explorative intervention study "We play the future!" eight different pretend play impulses for digital transformation were developed. 15 kindergarten educators were taking part in the study and received an introduction in a half day professional development course. After that course they implemented the free play impulses in their kindergarten for nearly four months. Video observation was carried out twice, capturing the educators' implementation and the children's play. The video data was analysed qualitatively.Sequences of pretend play were selected and analysed using multimodal interaction analysis (Goodwin, 2018; Montada, 2014).Results show that children gain experience in above-mentioned areas (Grassmann et al., 2021) through the pretend play impulses. Using multimodal interaction analysis, the importance of the guidance by the kindergarten teacher becomes clear.

Learning words with social robots: Preschoolers' multimodal behavior during retrieval difficulties
Presenting Author: Nils Frederik Tolksdorf, Paderborn University, Germany

Social robots have emerged as a new technology in early digital education and harbor the possibility of complementing future educational environments by engaging children in motivating and embodied learning contexts. While contemporary research indicates that social robots can support children in a variety of learning domains, less is known about children's interactional behaviors toward artificial agents such as social robots during educational long-term interactions. However, taking a closer look at children's communicative behavior holds the potential of informing future educational scenarios and develop implementations in a more responsive way. Therefore, in this study, we systematically addressed children's multimodal behavior over the course of two consecutive sessions and observed their attentional patterns and the use of gestures when they were engaged in a task with a robot to retrieve previously learned words during a shared book reading situation. Specifically, our analysis focused on the instances when children encountered difficulties in retrieving the learned words and relied in their response on nonverbal means. Overall, our results highlight that children not only frequently responded multimodally with gestures when interacting with the social robot and that they extended the interaction and involved their accompanying caregivers, but that this behavior also persists long-term. Results are discussed in terms of the role of children's communicative requirements in interaction with social robots and the implications for the design of future child–robot interactions to become responsive and helpful when interacting with a child.

Criteria for and development of high quality multilingual digital picture books
Presenting Author: Trude Hoel, University of Stavanger, Norway; **Co-Author:**Katarzyna Tunkiel, University of Stavanger, Norway

Shared book reading is a resource for language learning in early childhood settings (Dickinson & Morse, 2019). Digital books with language selection gives opportunity to read the story in a familiar language before it is read in the second language, which can support second language acquisition (Grøver, Rydland, Gustafsson, & Snow, 2020). Digitization also allows for pre-recorded audio recordings, so that caregivers who do not get to read with their child can still offer their child valuable reading experiences.In the research project SPrELL we aim to increase 3-4-year-old multilingual children's second-language learning as an effect of reading the same digital picture books in homes (in first language) and ECEC (in second language). In collaboration with the digital producer Lexplore, the research team are developing 20 digital picture books which offer a choice of language. In the design of the digital multilingual books, we aim to maintain high quality, both literary, linguistic, and digital. The book selection and the production are guided by the questions: What characterizes high quality in children's literature? What characterizes high quality in the translation of children's literature? What characterizes high quality in the digitization of children's literature? The result we aim for is a digital library consisting of 20 high-quality multilingual digital picture books, which have been selected in collaboration with children and EC teachers, developed in line with research-based knowledge and which facilitate work with children's second language acquisition.

Creativity apps for young children: analysis of app store data, characteristics, and quality
Presenting Author: Pinar Kolancali, University of Oxford, United Kingdom; **Co-Author:**Victoria Murphy, University of Oxford, United Kingdom; **Co-Author:**Sophie Booton, University of Oxford, United Kingdom

Many touchscreen apps claim to support children's creativity. Our study takes a systematic approach to reviewing a sample of commercially available apps to determine whether existing apps are indeed well designed to support children's creativity. The quality of a sample of 152 Android apps targeting 4- to 12-year-olds, claiming to involve creativity was rated using criteria based on extant research about factors that support creativity (e.g., experimentation, modelling). Quality ratings for creativity were overall low, particularly in relation to convergent thinking and modelling creativity. Key app store data was not a consistent predictor of creative app quality. Apps for older children also tended to score more highly. Thus, current apps for children's creativity are low in quality and app store data provides limited indication of their quality. Implications for parents, educators and app designers are considered.

Session H 2

24 August 2023 08:00 - 09:30
UOM_CH
Invited Symposium

Practice-Based Research Exploring the Complexity Between Teaching, Wellbeing and Innovation

Keywords: Artificial Intelligence, Communities of Learners and/or Practice, Emotion and Affect, Higher Education, Immersive Technologies for Learning, In-

service Teachers, Pre-service Teachers, Social Aspects of Learning and Teaching, Synergies between Learning / Teaching and Research, Teacher Professional Development, Teaching Approaches, Vocational Education and Apprenticeship Training, Well-being
Interest group:
Chairperson: Essi Ryymin, Häme University of Applied Sciences, Finland
Discussant: Emmy Vrieling, Open University of the Netherlands, Netherlands

In 2006, a team of EARLI researchers founded EAPRIL, the European Association for Practitioner Research on Improving Learning, which promotes collaboration between educational researchers and practitioners engaged in practice-based research on learning. In addition, EAPRIL encourages researchers interested in different levels of formal education to share knowledge; the collaboration provides a holistic perspective on education and allows researchers to examine the journey of students at different levels, identifying patterns, trends and gaps in their learning experiences. This will lead to a better understanding of the European educational system as a whole.

This EAPRIL symposium focuses on research on teaching practices and aims to explore the complexities and relationships between teachers' competence, teacher/student well-being and the promotion of innovation. The symposium will present various examples involving teacher and student perspectives across different cultures, school levels and age groups. The first presentation offers new insights into the physiological and self-reported wellbeing of university teachers in authentic teaching situations. The second contribution presents research on meaningful teaching and guidance practices of higher education students' writing their thesis. The third case introduces an empirical study of 360° video-supported teaching practices aimed at developing vocational students' emotional regulation skills and well-being. The fourth case describes a research programme investigating teachers' collective innovative behavior in comprehensive schools and its impact on innovative student projects. Finally, the symposium will discuss the impact of teaching practices on the perceived well-being and innovativeness of both teachers and students, and why it is important to develop these practices in a research-based way.

Promoting wellbeing of higher education teachers
Presenting Author: Liisa Postareff, HAMK University of Applied Sciences, Finland; **Co-Author:**Anna Parpala, University of Helsinki, Finland; **Co-Author:**Petri Nokelainen, Tampere University, Finland

Higher education teachers' psychological wellbeing is often challenged by various factors, such as time pressure, high workload, and challenges in supporting students' various needs. Moreover, demands caused by online and hybrid teaching have resulted in elevated levels of stress and anxiety. Recent research implies that through supporting teachers' learning-focused and interactive approaches to teaching it is possible to enhance their teaching-related wellbeing. Learning-focused and interactive teaching approach is associated with positive emotions and increased wellbeing, while lack of interaction and transmissive teaching strategies is associated with more negative emotions and stress. However, in-depth research on the relations between teaching approaches and wellbeing has been limited, and research has often adopted self-report measures. In our recent research, we have combined psychophysiological measures with self-report measures to examine the relations between teaching approaches and wellbeing in authentic teaching situations. Measurements with an ambulatory biosensor (Moodmetric Smart Ring) measuring electrodermal activity (EDA) imply that high arousal during teaching sessions is often captured during teaching focusing on information transmission, while lower levels of arousal are related with more interactive teaching episodes. In the presentation we will introduce our recent studies utilizing EDA measurement, self-report data as well as video-recorded data in authentic teaching situations and present findings of the relations between teachers' wellbeing and teaching approaches. We will also suggest diverse solutions to promote wellbeing of higher education teachers.

Guiding thesis circles in higher education: creating value for teachers and learners
Presenting Author: Kamakshi Rajagopal, AE - Adapt & Enable, Belgium; **Co-Author:**Ya Ping Hsiao, Tilburg University, Netherlands; **Co-Author:**Steven Verjans, Open University of the Netherlands, Netherlands; **Co-Author:**Emmy Vrieling, Open University of the Netherlands, Netherlands; **Co-Author:**Inge Damen, Open University of the Netherlands, Netherlands

Although the thesis is an integral part of an academic study program, supervisors approach the guidance of thesis students in various ways, focusing on eliciting high-quality research practice and academic writing. This type of guidance is often complicated and tailored to the needs of individual students, which is often not feasible due to increasing numbers of students and the need for efficiency. Moreover, in a world where generative AI and tools like ChatGPT is more prevalent, the focus on the process of thesis development is likely to become increasingly important - posing different challenges to supervisors. One possible solution to achieve efficient and quality guidance is working with thesis circles: small collaborative groups in which students, together with one or more supervisors, conduct research on the same subject or theme. Thesis circles offer opportunities for self-regulated learning, (peer) feedback and prevention of feelings of loneliness. Using the Educational Design Research paradigm, we aim to support supervisors implementing this type of educational innovation with sufficient conceptual, theoretical and practical support, through iterative cycles of problem analysis, instrument design and evaluation. This presentation will reflect on the trajectory undertaken by this distributed research team over more than 5 years as well as the practicalities of implementing a productive research strategy that creates academic conceptual value as well as gains for practice. We will also present the latest outcomes of our recent practice-based study on the design of thesis circles and their effects on students' perception of the thesis process.

Does watching oneself / someone in an immersive video affect emotions and sense of presence?
Presenting Author: Vito Candido, SFUVET, Switzerland; **Co-Author:**Francesca Amenduni, Swiss Federal University for Vocational Eduation and Training (SFUVET), Switzerland; **Co-Author:**Alberto Cattaneo, Swiss Federal University for Vocational Education and Training, Switzerland

An immersive 360° video (360°VR) allows to elicit emotions like those people experience in real life contexts. For this reason, 360°VR has been growingly considered a tool to support emotion regulation competences in professional learning situations. Video recording a professional performance is a common instructional strategy, which can also be implemented with a 360°VR. As with traditional video, you can both work on recordings of your own or of other people. However, to the best of our knowledge, it is unclear to what extent watching oneself or others in a 360°VR affect emotions and sense of presence (SoP). This exploratory research was conducted in a Vocational Education and Training course for social and health workers on the topic of blood sampling, a procedure which requires novices to regulate their emotions (e.g., fear of injuring the patient). Participants (N=36; F=24; Mean age=17,6) were assigned to two conditions: watching a video of themselves performing blood sample (SELF) or of a peer performing the same procedure (PEER). Both groups filled out a questionnaire on epistemic emotions and SoP immediately after viewing the 360°VR. For both conditions, the three highest emotions have positive valence: curiosity, enthusiasm, and surprise. However, in the SELF condition participants reported significantly higher level of high-arousing negative emotions (anxious and frustration) compared to the PEER condition. Moreover, in the SELF condition participants reported significantly higher level of SoP than in the PEER condition. SoP strongly correlates with three emotions: curiosity, enthusiasm, and confusion. This study suggests that watching oneself in a video is more emotionally engaging and creates greater SoP than watching others. The research provides initial contributions on the relation among SoP and emotions in 360°VR in relation to the difference between watching oneself and someone else. Limitations include small sample size and non-randomized assignment to conditions.

Social capital related to teachers' innovative behaviour: a scientific and practice-based approach
Presenting Author: Stefan Robbers, Open University Netherlands, Netherlands; **Co-Author:**Emmy Vrieling, Open University of the Netherlands, Netherlands; **Co-Author:**Marjan Vermeulen, Heerlen Open Universiteit, Netherlands; **Co-Author:**Arnoud Evers, Open Universiteit, Netherlands

The rapid changes in the knowledge and skills that students need to learn require education, and therefore teachers, to innovate in order to continue to provide students with the education that will benefit them in their future careers. When teachers are in the process of developing or implementing innovations on their own initiative, this can be considered innovative behaviour (IB). IB is characterised by the generation, promotion, and realisation of new ideas, which makes it a form of knowledge development and therefore learning. In contrast to learning, to our knowledge, IB has not been categorised as formal/informal or individual/collective, leaving a gap in the literature, as IB, like learning, is likely to take place informally and collectively, in collaboration with colleagues. Because teachers' collective IB is a highly relevant topic for both science and educational practice, a two-pronged research program with a scientific and a practice-oriented approach was designed. The scientific approach led to the development of a new questionnaire for IB and insights into how shared vision as part of social capital theory plays a role in explaining informal, collective IB. These scientific findings were consistent with practice, where it was found that teachers who participated in knowledge networks with shared goals exhibited higher levels of IB. This led to a number of innovative projects for students in different

primary schools, in which teachers from primary and secondary schools collaborated.

Session H 3

24 August 2023 08:00 - 09:30
AUTH_T002
Symposium

Mathematical strategy use: can we expect everyone to be flexible in all circumstances?

Keywords: Cognitive Skills and Processes, Developmental Processes, Mathematics/Numeracy, Misconceptions, Primary Education, Quantitative Methods, Science and STEM, Secondary Education
Interest group:
Chairperson: Erika Schlatter, Leiden University, Netherlands
Organiser: Marian Hickendorff, Leiden University, Netherlands
Organiser: Jake McMullen, University of Turku, Finland
Organiser: Erika Schlatter, Leiden University, Netherlands
Discussant: Hedwig Gasteiger, Germany

Procedural flexibility, or being able to solve a problem in multiple ways, is viewed as an important goal in mathematics education. However, not everyone is equally able to use a variety of strategies for solving math problems. Furthermore, even if someone has a variety of strategies at hand, choosing the most suitable strategy (i.e., behaving adaptively) can prove to be difficult. This symposium brings together four studies addressing the factors enabling and inhibiting procedural flexibility in both children and adults.The first contribution focuses on how grade level is related to second, third and fourth graders' flexibility and adaptivity in multi-digit subtraction, finding that third graders show most flexibility, but fourth graders more often choose the strategy that works best for them. The second contribution focuses on the relation between flexibility and executive functions in multidigit subtraction in fifth grade students. This study found that strategy selection related to updating, and strategy execution related to both updating and shifting. The third contribution relates adaptive number knowledge with mathematical flexibility in upper secondary school students, finding that students with high adaptive number knowledge are more flexible mathematical problem solvers as well. The fourth contribution addresses how misconceptions concerning the order of operations may inhibit flexible strategy use, specifically strategies using the associativity principle, in adults solving three-term arithmetic problems. Together, these studies provide insight as to what does and doesn't help children and adults to flexibly solve math problems, which can help teachers address these factors more accurately in their lessons.

What strategy works for whom? Flexible and adaptive strategy use in primary school mathematics.
Presenting Author: Erika Schlatter, Leiden University, Netherlands; **Co-Author:**Marian Hickendorff, Leiden University, Netherlands

Adaptive expertise, the ability to use multiple strategies and select the optimal strategy to solve an arithmetic problem, is an important goal in Dutch primary school mathematics. Previous research shows children do not use all the strategies they know and often stick to a single strategy, even if that strategy is not mathematically optimal (i.e. requires the easiest and/or smallest number of steps). As children consistently show this behavior, the question rises what the best strategy to solve a problem is: the mathematically optimal strategy, or the strategy children use so often it has been fully automated. The current study used an innovative, personalized choice/no-choice paradigm to determine what strategies Dutch second, third, and fourth graders (N = 204) use for multi-digit subtraction in a free choice condition, and in a second session investigated whether the strategy of their choice is faster and more accurate than the mathematically optimal strategy. Children overwhelmingly chose one single strategy on all eight free-choice problems, showing limited procedural flexibility. When prompted, children were able to produce additional strategies. Third graders produced significantly more additional strategies than second graders, and fourth graders produced significantly more additional strategies than third graders. Children rarely chose a shortcut strategy suited to a particular problem, and also had trouble recognizing appropriate shortcut strategies. However, fourth graders were able to choose the strategy that worked best for them in terms of accuracy and speed.

Are strategy selection and execution in multidigit subtraction related to executive functions?
Presenting Author: Stijn Van Der Auwera, KU Leuven, Centre for Instructional Psychology and -Technology, Belgium; **Co-Author:**Bert De Smedt, KU Leuven, Belgium; **Co-Author:**Joke Torbeyns, KU Leuven, Belgium; **Co-Author:**Lieven Verschaffel, KU Leuven, Belgium

We examined 150 fifth-graders' (M_{age} = 10y11m) selection and execution of direct subtraction (DS; e.g., 712–346=?; 712-300=412, 412-40=372, 372-6=366) and subtraction by addition (SBA; e.g., 712–346=?; 346+54=400, 400+300=700, 700+12=712 and 54+300+12=366) strategies to solve multi-digit subtractions, and whether these two strategy parameters were associated with their executive functions (EFs). Both strategy selection and execution were examined by means of the choice/no-choice method. Participants were offered ten subtractions in one choice condition (free choice between DS and SBA) and in two no-choice conditions (mandatory use of either DS or SBA). Strategy selection was examined in the choice condition, and strategy execution (in terms of accuracy and speed) in the no-choice conditions. Concerning the EFs, updating was measured using a 2-back task, inhibition by means of a Flanker task, and shifting via a Trail Making Task. Results showed that strategy selection was associated with updating, but not with inhibition and shifting. Concerning strategy execution, children's accuracy in the no-choice conditions was associated with updating and shifting, but not with inhibition. Furthermore, no associations were found between EFs and speed in the no-choice conditions. This study shows the different associations of EFs components with strategy selection and execution in the domain of multi-digit subtraction, and helps to unravel via which mechanisms EFs are associated with mathematical performance.

Misconceptions of the order of operations and the use of conceptually-derived arithmetic strategies
Presenting Author: Joanne Eaves, Nottingham University, United Kingdom; **Co-Author:**Camilla Gilmore, Loughborough University, United Kingdom; **Co-Author:**Nina Attridge, University of Portsmouth, United Kingdom

Knowledge of the associativity principle is important for progressing beyond elementary mathematics, however few individuals use associativity-based arithmetic strategies. We explored whether misunderstanding or misapplication of the order of operations played a role in this. First, we developed an instrument that quantitatively measures how people interpret the order of operations. We then used this instrument in a well-powered, pre-registered study to investigate whether those interpretations relate to use of the associativity shortcut strategy. We found that only 16% of adults (university students) fully understood the order of operations, and that a particular misconception of the order of operations (a 'literal' misconception of the acronym 'BODMAS') hinders associativity shortcut use. We conclude that procedural rules can be a barrier to flexibility with arithmetic strategies, if those rules are faulty and/or rigidly adhered to. Teachers should be made aware of the dangers of misconceptions, and could use our instrument to identify them.

Adaptive number knowledge is related to procedural flexibility in highschoolers
Presenting Author: Irene Pampallis, University of the Witwatersrand, South Africa; **Co-Author:**Jake McMullen, University of Turku, Finland; **Co-Author:**Jon Star, Harvard Graduate School of Education, United States; **Co-Author:**Koen Veermans, University of Turku, Finland

Adaptive expertise is increasingly regarded as an important element of students' mathematical development. One component of adaptive expertise with arithmetic is adaptive number knowledge (ANK), the well-connected understanding of numerical characteristics and relations which can be used to solve novel problems. However, the relationship between ANK with whole numbers and ANK with rational numbers remains uncertain. It is also not known whether ANK is related to procedural flexibility. In this paper, we show that all three constructs are interrelated. A sample of 447 US high school students aged 13-18 completed a pen-and-paper test of ANK and procedural flexibility. The relationship between ANK with whole numbers and ANK with rational numbers was investigated using an exploratory factor analysis. The analysis revealed a single factor which explained 54.65% of the observed variance after extraction, suggesting a single ANK construct that is consistent across both whole and rational numbers. A paired-samples t-test revealed a significant difference in ANK between flexible and non-flexible problem solvers: flexible problem solvers had on average 3 more correct solutions on the ANK task than non-flexible problem solvers (Cohen's d=.50). This paper therefore establishes a strong relationship between ANK for whole numbers, ANK for rational numbers, and procedural flexibility in high

school students. Further research should explore the precise nature of these relations.

Session H 4

24 August 2023 08:00 - 09:30
AUTH_DC1
Symposium
Assessment and Evaluation, Teaching and Teacher Education

Investigating the Technological Pedagogical and Content Knowledge model from a bird's eye view

Keywords: Assessment Methods, Competencies, Computer-assisted Learning, Educational Technologies, Meta-analysis, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Andreas Lachner, University of Tübingen, Germany
Organiser: Armin Fabian, University of Tuebingen, Germany
Organiser: Iris Backfisch, University of Tuebingen, Germany
Discussant: Charoula Angeli, University of Cyprus, Cyprus

The Technological Pedagogical and Content Knowledge (i.e., TPACK; Mishra & Koehler, 2006) model has been proven useful when contemplating teachers' professional knowledge necessary for meaningful technology integration in teaching. Within this model, TPACK refers to an integrated form of knowledge that emerges through the interplay of several different knowledge components (i.e., technology-related, pedagogy-related and content-related knowledge). Despite its conceptual clarity, research findings have identified at least two major issues regarding the TPACK model: The lack of empirical clarification and the models' practical applicability in designing training programs. To provide guidance for future researchers, the present symposium seeks to address these issues by providing four synthesis contributions (3 reviews & 1 meta-analysis) on TPACK granting a birds-eye perspective on TPACK. By analysing TPACK-related reviews, the first contribution outlines overarching themes that have emerged since the models' introduction, and hence provides a meta-meta perspective on TPACK. The second and third contribution then zoom in onto issues regarding the empirical validation of TPACK. Whereas the second contribution offers a systematic review on measures of competence-related beliefs framed within TPACK, the third contribution focuses on self-report measures and uses a meta-analytical approach to investigate whether these measures have been successful in empirically validating the TPACK model. Finally, the fourth contribution offers a systematic review on TPACK-based training programs to shed light onto the practicality of the TPACK model in teacher education.Taken together, this symposium clarifies central issues surrounding the TPACK model, and therefore paves the way for future research in this complex field.

Looking at the forest (not the trees): A systematic review of systematic reviews on TPACK
Presenting Author: Eliana Brianza, University of Zurich, Institute of Education, Switzerland; **Co-Author:**Mirjam Schmid, University of Zurich, Switzerland; University of Queensland, Australia, Switzerland; **Co-Author:**Sog Yee Mok, University of Teacher Education of the Grisons, Switzerland; **Co-Author:**Dominik Petko, University of Zurich, Switzerland

As one of the most prominent frameworks for describing teachers' professional knowledge in the digital age, the technological pedagogical content knowledge framework (TPACK; Mishra & Koehler, 2006) has now over 15 years of research at its heels. Today, there are hundreds of studies employing the TPACK framework. In recent years, the framework has evolved with regard to several aspects: On a theoretical level, the framework has undergone adaptations, extensions, and specifications relating to the school subject, the technology, or the pedagogical approach. On a methodological level, a variety of instruments have been developed and empirically tested and validated. Extensive research exists around TPACK, which is why various (systematic) reviews and meta-analyses on TPACK have been published. However, these each address different aspects and due to the abundance of such summary work, it is now necessary to go a step further and a systematic review of reviews and meta-analyses is needed. We conducted a systematic review on systematic reviews and meta-analyses of TPACK published between 2006 and 2020 following the PRISMA statement. This resulted in a final sample of $N = 13$ records meeting all eligibility criteria. To uncover the main themes and gaps, we applied content analysis to the discussion and conclusion sections of the reviews. Six main overarching themes in relation to TPACK emerged: Conceptualizing, researching, fostering, applying, situating, and relating.

A systematic review on measures of teachers' competence-related beliefs about ICT use
Presenting Author: Charlott Rubach, University Rostock, Germany; **Co-Author:**Rebecca Lazarides, University of Potsdam, Germany

The TPACK model is a significant theory that explains how teachers integrate digital technology in class. The model suggests that competence and competence-related beliefs based on technological, content, and pedagogical knowledge are essential for effective digital technology use. However, several TPACK-inspired instruments exist on competence beliefs, raising questions about the extent to which they differ and the possibility to replicate findings across studies. This systematic review summarizes existing TPACK instruments on teachers' competence beliefs related to covered knowledge areas. In the second step, we focused on technology knowledge (TK) and have investigated the extent to which different competence dimensions have been covered across different measures. 17 studies published between 2016 and early 2021 were included in this rapid systematic review. These 17 studies assessed TPACK competence-related beliefs in 17 different ways with varying thematic focuses. In addition to the large variability of used instruments, the labels also vary. Competence beliefs on technology knowledge mainly covered the competence dimension of problem solving and technology use. Thus, our systematic review points to a high diversity of measures of teachers' competence-related beliefs contextualized within the TPACK model. These results point to the fact that the comparison of results among studies using TPACK instrument might be challenging.

Meta-analysis to examine the validity of TPACK self-report assessments
Presenting Author: Iris Backfisch, University of Tuebingen, Germany; **Co-Author:**Jürgen Schneider, German Institute for International Educational Research (DIPF), Germany; **Co-Author:**Andreas Lachner, University of Tübingen, Germany; **Co-Author:**Katharina Scheiter, University of Potsdam, Germany; **Co-Author:**Ronny Scherer, University of Oslo, Norway

Teachers' technological-pedagogical-content knowledge (TPACK, Mishra & Koehler, 2006) for meaningful technology-enhanced teaching is conceptualized as an amalgam of several knowledge components (e.g., technological-pedagogical knowledge TPK; technological knowledge, TK). Due to its complexity, TPACK is mostly assessed via self-report questionnaires. However, the use of self-report TPACK measures might lack conceptual validity as self-report measures might not represent the structure of the TPACK model and the relations of its dimensions and, therefore, the interpretation of results from these studies might be complicated and biased. We conducted a meta-analysis with a final sample of $N = 80$ papers encompassing data from 29,212 teachers. Meta-analytical correlation analyses revealed that the conceptually proposed structure of TPACK as a Venn diagram with all knowledge components being similarly correlated to TPACK does not hold. Rather, the findings suggest a hierarchical structure of the knowledge components with basis knowledge components (e.g., TK), leading to intersections (e.g., TPK), ultimately, leading to TPACK. These findings should be considered when interpreting and drawing conclusions from studies based on self-report data.

A data-driven systematic review of TPACK-based professional development programs
Presenting Author: Armin Fabian, University of Tuebingen, Germany; **Co-Author:**Iris Backfisch, University of Tuebingen, Germany; **Co-Author:**Kenneth Kirchner, University of Tuebingen, Germany; **Co-Author:**Andreas Lachner, University of Tübingen, Germany

Fostering teachers' professional knowledge regarding the integration of technology is paramount in today's digitized society. Due to its accessibility, the Technological Pedagogical and Content Knowledge (TPACK) framework has been commonly used as a theoretical foundation for the design of adequate professional development programs (PDPs). By adapting TPACK to their specific research needs, however, researchers have introduced a variety of seemingly different approaches to foster technology-related knowledge within TPACK-based PDPs. To date, there is no comprehensive overview of how such approaches relate to the seven knowledge components of TPACK (i.e., TK, PK, CK, TPK, TCK, PCK & TPCK) making it difficult to compare and build upon existing research findings. Therefore, the present data-driven systematic review seeks to shed some light onto the diversity of TPACK-based PDPs. To do so, we applied content analysis to analyse $n = 138$ TPACK-based PDPs and investigate which of the seven TPACK-components were explicitly addressed during these PDPs. Then,

we explored possible relationships of TPACK-components by means of several χ^2-tests. Results indicate that researchers still consider TK a central pre-requisite for the aquisition of technology-related knowledge. Moreover, TPACK seems to have been approached most frequently from a subject-specific perspective.

Session H 5

24 August 2023 08:00 - 09:30
AUTH_DC2
Symposium
Developmental Aspects of Instruction, Learning and Social Interaction

Children's argumentation

Keywords: Argumentation, Communication Skills, Developmental Processes, Dialogic Pedagogy, Early Childhood Education, Learning Strategies, Social Aspects of Learning and Teaching, Teacher Professional Development, Teaching Approaches
Interest group: SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Chrysi Rapanta, Universidade Nova de Lisboa, Portugal
Chairperson: Jarmila Bubikova-Moan, Norway
Discussant: Antonia Larrain, Universidad Alberto Hurtado, Chile

It is well reported in scientific literature that children are able to argue and counterargue from a very young age. Although this naturally developed skill does not imply mastery, it does not exclude the possibility of improvement through different forms of instruction. However, the conditions that favour the emergence and development of argument skills during childhood are not yet sufficiently understood from a pedagogical point of view. In this symposium, we adopt a socio-constructivist view of argument(ation) development combined with philosophical theories that underlie the concept of argument, argumentation, and the criteria of their quality. Our overall aim is twofold: first, to show the early presence of the so-called “argument schema” and second, to understand how the framing or design of specific pedagogical situations can lead to its fuller emergence. Papers 1 and 2 address the first sub-goal, whereas Papers 3 and 4 respond to the second. The symposium’s expected contributions and points for discussion are threefold: 1) a better understanding of argument development in the early years (Papers 1 and 2), 2) an illustration of pedagogies that aim at the full manifestation of children’s argument skills through dialogue, as well as teacher-related obstacles to their implementation (Paper 3), and 3) a cross-sectional comparison of argument skills from early childhood to adolescence (Paper 4). The symposium relates to the conference’s general theme of education under uncertainty as it focuses on children’s argumentation about ill-defined issues as a skill and as a practice, both key in nowadays’ fluid societies.

Argumentation in the early years: a meta-synthesis of research
Presenting Author: Jarmila Bubikova-Moan, Oslo Metropolitan University, Norway

There is a considerable body of research on argumentation in the educational field, particularly as it is fostered through dialogic forms of instruction among school-aged children and youth. For reasons of both conceptual and methodological nature, there is generally less scientific evidence on argumentation in the youngest, preschool age-groups. While on the rise, the available research does not form a unified body of scholarship but is spread across a number of different scientific fields, including argumentation studies, education, linguistics and developmental psychology. Facilitated by a meta-synthesis of 57 studies that met our inclusion criteria, we aimed to systematize the current body of knowledge and, as such, propel to visibility its main conceptual patterns and tendencies. The review documents that children’s argumentation has been studied from a range of theoretical perspectives, with the dialogic view of argumentation and a productive theoretical eclecticism as their common denominators. Furthermore, the review sheds light on a range of structural and discursive features in children’s argument construction and evaluation as well as children’s great sensitivity to aspects of the social-interactional context in which they engage in argumentation. Lastly, the review provides systematic evidence on the developmental nature of these features. We will discuss the implications of our findings in terms of further theory-building but also their practical educational significance.

Argumentation and dialogical shifts in young children’s role play
Presenting Author: Margareth Sandvik, Oslo Metropolitan University, Norway

Children’s free play in the kindergarten mostly goes on undisturbed with no involvement from the practitioners. To fully participate in all aspects of role play, language competences in negotiation and argumentation are required. The present paper shows how a group of three children (aged four), roleplay around making food in a quiet corner of the kindergarten, equipped with typical food making artefacts. Disagreement arises around the competition of some of the artefacts. The paper focuses on how the children manage to solve the disagreement, how the argumentation escalates into a quarrel and a physical fight, before the conflict is solved. The argumentation analysis combines pragma-dialectical reconstruction, thus showing the structure of the children’s argumentation, and a functional perspective on argumentation schemes and dialogical shifts, showing how children relate their arguments to their claims and how the role play can be described along phases, which means that different types of argumentative dialogue can be characterised. The data is drawn from a project on children’s audio recorded and transcribed talk in the kindergarten.

Changing practices in dialogue and argumentation:Teachers’ voice on effective aspects of PD
Presenting Author: Maria Vrikki, University of Nicosia, Cyprus; **Co-Author:**Riikka Hofmann, University of Cambridge, United Kingdom; **Co-Author:**Elena Papanastasiou, University of Nicosia, Cyprus; **Co-Author:**Maria Evagorou, University of Nicosia, Cyprus; **Co-Author:**Fiona Maine, University of Exeter, United Kingdom

Changing teaching practices and classroom culture in ways that support dialogue and argumentation has proved challenging. Research evaluating the outcomes of teacher professional development (PD), which aim to promote classroom dialogue and argumentation, has offered mixed findings to date. The purpose of this study is to explore which aspects of a PD program specially designed to promote dialogue and argumentation teachers appreciate the most. As part of a larger European project, which aimed to promote young students’ cultural literacy (values such as tolerance, empathy and inclusion) via dialogue and argumentation in pre-primary, primary and secondary schools, a PD program was developed. The PD will be presented in detail during the presentation. A Reflection Questionnaire was completed by 134 teachers from six countries at the end of the PD to obtain information on the PD. The central finding from the quantitative and qualitative data is that the teachers evaluated the PD as very useful in supporting them to: improve their dialogue and argumentation teaching practices; to use wordless texts; and to improve their cultural literacy teaching practices. A high and positive correlation was found between the reported effects of the programme on teaching practices in dialogue and argumentation and their own understanding of the concept of cultural literacy. In addition, teachers point to specific aspects of the PD that they have found helpful for their own learning; these include behavioral strategies, peer reflection and use of discursive tools. Such insights from teacher voice can inform future designing of professional development programmes.

A cross-comparative analysis of children’s arguments in 5 European countries
Presenting Author: Chrysi Rapanta, Universidade Nova de Lisboa, Portugal; **Co-Author:**FABRIZIO MACAGNO, Universidade Nova de Lisboa, Portugal

Participating in reasoned discourse facilitates the manifestation of more advanced argument strategies by both children and adolescents. However, the conditions under which this facilitation takes place are not yet fully uncovered. Several factors may be influential, such as: topic/ issue of discussion, prompts made by others, either peers or adults, and students’ ability and motivation. Other factors such as culture and age are not yet sufficiently studied within a formal education context. The present study aims to address this gap, by asking: How do students from three developmentally distinctive age groups (5-6, 8-9, and 14-15 years old) perform in oral argumentation when discussing about issues of a social nature? Are there sociocultural differences in their argumentive performance? And how such performance can be assessed? We focus our analysis on an extended corpus (53.000 turns) of classroom discussions taking place in UK, Portugal, Spain, Cyprus and Germany as part of a larger study. Discussions aimed at the development of dialogic and argument skills among children and adolescents. In this presentation, our focus will be on young children, and how and when they argue in more or less sophisticated ways, as

compared across settings (whole class/small group), country, and age group. Our analysis combines a structural (Toulmin Argument Pattern) and functional (Walton's argumentation schemes) approach to argumentative reasoning. Our findings show significant variations across age groups and social settings. Discussion aims at a sociocultural framing of argument reasoning development.

Session H 6

24 August 2023 08:00 - 09:30
UOM_R09
Symposium
Learning and Special Education, Motivational, Social and Affective Processes

Meeting the Needs of Gifted and Talented Students

Keywords: At-risk Students, Creativity/Divergent Thinking, Cultural Diversity in School, Curriculum Development, Gifted and Talented Students, In-service Teachers, Inclusive Education, Mixed-method Research, Motivation, Parental Involvement in Learning, Primary Education
Interest group: SIG 08 - Motivation and Emotion, SIG 15 - Special Educational Needs
Chairperson: Marielle Wittelings, Behavioural Science Institute, Radboud University Nijmegen, Netherlands
Organiser: Jessica Vergeer, Radboud University Nijmegen, Behavioural Science Institute, Netherlands
Organiser: Marielle Wittelings, Behavioural Science Institute, Radboud University Nijmegen, Netherlands
Organiser: Mare van Hooijdonk, Radboud University Nijmegen, Netherlands
Discussant: Karine Verschueren, KU LEUVEN, Belgium

Currently, gifted students are not always able to reach their full potential because they receive an education that does not match their talents and educational needs. The misconception that "gifted students will make it on their own" remains persistent, and a one-size-fits-all curriculum for gifted students simply does not work, nor does it exist. This symposium is focused on meeting the needs of the diverse group of gifted and talented students and on what is needed to provide adequate education for these students. More specifically, the symposium aims to discuss how a well-formed, motivating curriculum can be developed for these students, that includes and encourages creativity but also pays attention to the environment of the student (i.e. the school and home environment) and all actors within. Besides that, the specific needs of low-achieving and disadvantaged gifted students will also be discussed. This will provide us with valuable insights in the needs of this diverse group of gifted students and will highlight future research angles and implications for practice to further study and develop gifted education. After all, it is important to provide accurate and effective education to all of those students to ensure they can develop to their full potential.

CANCELLED: The effectiveness of the Achievement Motivation Enhancement (...)
Presenting Author: Ophelie Desmet, Dewar College of Education, Valdosta State University, United States

This presentation has been cancelled and will not be presented at the EARLI conference.
This presentation will include findings from a series of five studies evaluating an affective-motivational curriculum for gifted and talented youth, the Achievement Motivation Enhancement (AME) curriculum, to gain a further understanding of its effectiveness. We evaluated the AME curriculum in five different educational settings (summer enrichment program, middle school, emergency remote teaching during the pandemic, through a mixed-methods program of studies. This program of studies showed that positive changes in academic achievement, behavioral engagement, self-perception, self-regulation, planning skills, self-monitoring, and attitudes toward school occurred when the intervention was implemented. Therefore, these findings offer valuable insights for developing and implementing affective interventions targeting achievement motivation with gifted and talented students.

Creativity in full-time and part-time gifted education
Presenting Author: Mare van Hooijdonk, Radboud University Nijmegen, Netherlands; **Co-Author:**Loes Marsman, Radboud University Nijmegen, Netherlands

This study investigated differences in creativity between elementary school pupils aged 9 to 12 years (M age = 9.68), attending full-time and part-time gifted education, and those attending regular education at the same school. A total of 93 pupils participated. The pupils' creativity was assessed with divergent thinking and creative drawing tasks. Apart from that, students and teachers completed a short creativity questionnaire. The study showed that pupils in full-time gifted education scored higher than pupils in part-time gifted education and regular education on two out of three aspects of divergent thinking: fluency and originality. No differences were found between pupils on the elaboration indicator. The pupils in full-time gifted education also outperformed the other students on creative drawing, but only when the creative drawing scores were adjusted for time. Additionally, pupils attending full-time gifted education perceived themselves as more creative than students in the other educational settings. On the contrary, teachers in part-time gifted education perceived their students as more fluent and more original in their ideas. In short, pupils attending full-time gifted education outperformed pupils from part-time gifted education and regular education on most creativity tasks. Full-time gifted education thus seems to cater to gifted pupils' need for creativity.

Inclusive Education for Gifted Students: A Systemic Approach
Presenting Author: Jessica Vergeer, Radboud University Nijmegen, Behavioural Science Institute, Netherlands; **Co-Author:**Marjolijn van Weerdenburg, Radboud University Nijmegen, Behavioural Science Institute, Netherlands; **Co-Author:**Trudie Schils, Maastricht University, School of Business and Economics, Netherlands; **Co-Author:**Anouke Bakx, Fontys University, Radboud University, Netherlands

This paper presentation is about a large scale study, consisting of multiple studies, entitled "Inclusive Education for Gifted Students: A Systemic Approach". This project focuses on the impact of environmental (f)actors on educational interventions for gifted students, in order to improve inclusive primary and secondary education for Dutch gifted students. The impact of educational adaptations for gifted students may vary, depending on several (f)actors and partly due to a lack of knowledge and empirical evidence. From a systemic perspective, it seems likely that the success of interventions for gifted students may depend on involvement of different environmental (f)actors in the system around the student. Therefore, this project focuses on educational (teachers), policy (school leaders), and family (parents) actors, using a systemic approach to investigate working mechanisms and underlying conditions of educational interventions for gifted students. Teachers, school leaders, and parents took part in a questionnaire and in an interview. All three actor groups seemed to be more satisfied with primary gifted education compared to secondary gifted education, and considered all of each other's involvements as important. Gifted education teachers and parents of primary gifted students were mutually more satisfied with each other's interactions compared to secondary gifted education. In order to map and measure the actual impact of the collaboration and interaction between these actor groups on gifted education, more research is needed.

Identifying and Providing Supports for Gifted Students from Low-Income Households in Dublin, Ireland
Presenting Author: Leeanne Hinch, Dublin City University, Ireland

Currently there are no standardised provisions for gifted students in the Irish education system. As such, this means that individual teachers must shoulder the burden of differentiating in the classroom without adequate support if they wish to try to support the high ability students in their classes. Often students' families must seek out alternative educational opportunities for their child to ensure they are adequately challenged, which is not something that every family is capable of doing, particularly those from socio-economically disadvantaged backgrounds. The Centre for Talented Youth, Ireland (CTYI) based in Dublin City University (DCU) provides enrichment classes for approximately six thousand gifted students across Ireland each year. CTYI has run multiple projects focussing specifically on high ability students from socio-economically disadvantaged backgrounds. To better advocate for and accommodate these students, CTYI has carried out numerous studies on the various supports that exist for gifted socially economically disadvantaged students in Ireland. This presentation will highlight the findings of several of these studies and provide recommendations for what accommodations can be made for children in similar situations. Supports provided by CTYI in the form of enrichment programmes for disadvantaged students have been shown to raise the self-esteem of many of these students, with the majority feeling more confident in their academic abilities. In addition, these programmes had positive outcomes for students' social skills.

Session H 7

24 August 2023 08:00 - 09:30
AUTH_TE2
Symposium
Learning and Social Interaction, Motivational, Social and Affective Processes

Using experience-sampling methods to understand processes of learning and instruction

Keywords: Achievement, Developmental Processes, Emotion and Affect, Engagement, Mathematics/Numeracy, Motivation, Peer Interaction, Primary Education, Quantitative Methods, Science Education, Secondary Education, Self-concept, Self-regulated Learning and Behaviour, Social Aspects of Learning and Teaching, Teacher Effectiveness, Teaching/Instructional Strategies
Interest group:
Chairperson: Hanna Dumont, University of Potsdam, Germany
Organiser: Hanna Dumont, University of Potsdam, Germany
Discussant: Garvin Brod, Germany

Experience-sampling methods (ESM), sometimes also referred to as Ecological Momentary Assessment (EMA), Ambulatory Assessments (AA), and including the Daily Diary (DD) methodology, examine individuals' experiences, behaviors, thoughts or feelings via self-reports which are collected at multiple time points over several days or weeks and "in-situ" as individuals go about their daily lives. Typically, mobile devices are used to collect these intensive longitudinal data. ESM have several advantages over traditional self-report methods: First, given the proximity in time to individuals' experiences, they reduce retrospective bias. Second, because data are collected in real-world settings, ESM have greater ecological validity. Third, the multiple measurement points lead to more statistical power and higher reliability. Fourth, intensive longitudinal data allow to disentangle intra-individual differences from inter-individual differences and context-specific factors and to study intra-individual processes over time. The aim of this symposium is to bring together four papers, which have made use of these advantages to study intra-individual processes of student motivation, engagement and self-regulation in school via ESM. All papers have in common that they employ event-focused sampling by surveying students from different classrooms after multiple lessons; Paper 2 additionally collected data from students within lessons. Moreover, all papers use cross-lagged models accounting for the hierarchical data structure with time points nested in students. Taken together, the set of papers shows the great potential of ESM to better understand processes of learning and instruction.

Intraindividual dynamics between self-concept and perceived mathematics learning achievement
Presenting Author: Christoph Niepel, University of Luxembourg, Luxembourg; **Co-Author:**Herb W. Marsh, Australian Catholic University, Australia; **Co-Author:**Jiesi Guo, Australian Catholic University, Australia; **Co-Author:**Reinhard Pekrun, Australian Catholic University, Australia; **Co-Author:**Jens Möller, Kiel University, Educational Science, Germany

Achievement and academic self-concept have been found to be reciprocally related across time. So far, existing research has focused on interindividual relations across longer time periods. This is problematic in that findings from interindividual (between-person) approaches do not necessarily correspond to those from intraindividual (within-person) approaches. Moreover, it appears that no longitudinal study of the relations between self-concept and achievement has used intensive longitudinal methods to examine the short-term dynamics of self-concept and achievement in real time in actual learning situations. For the first time, the present study investigated intraindividual dynamics of students' momentary (state) academic self-concept and lesson-specific perceived learning achievement (i.e., self-reported comprehension) on a lesson-to-lesson basis. We focused on the domain of mathematics. We implemented an e-diary (experience sampling via smartphones) study and examined data from 372 German ninth and tenth graders after every mathematics lesson. Data were collected over a period of 3 weeks. State mathematics self-concept and lesson-specific perceived learning achievement were assessed with 3 items each. A multilevel confirmatory factor analysis confirmed the assumed 2-factor structure. Both mathematics self-concept and learning achievement showed substantial intraindividual variation over time. We specified a multilevel first-order vector autoregressive model within the dynamic structural equation modeling framework in Mplus. We found short-term, intraindividual reciprocal relations between state self-concept and perceived learning achievement from one school lesson to the next. We discuss practical and theoretical implications of our findings.

Intraindividual dynamics and fluctuations of competence, engagement and disaffection
Presenting Author: Jussi Järvinen, University of Helsinki, Finland; **Co-Author:**Lauri Hietajärvi, University of Helsinki, Finland; **Co-Author:**Elina E. Ketonen, University of Helsinki, Finland; **Co-Author:**Lars-Erik Malmberg, University of Oxford, United Kingdom; **Co-Author:**Katariina Salmela-Aro, Helsinki University, Finland

Educational researchers have been increasingly interested in situational learning experiences, such as momentary engagement. However, the research on dynamic relationships between different components of engagement and its facilitators is scant. The aim of the present study was to examine the intraindividual fluctuations of and dynamic relationships between perceived competence, behavioural and emotional engagement, and emotional disaffection. The participants were first-year high school students who responded to three momentary experience sampling method (ESM) questionnaires in science lessons during a two-week period. We used two different samples to examine the dynamics from moment to moment within lessons ($N_{situations}$ = 3823, $N_{students}$ = 276) and between lessons ($N_{situations}$ = 1791, $N_{students}$ = 133), respectively. We specified random intercept cross-lagged panel models to examine these within-person associations on each of the two levels. The results showed a carry-over effect of competence and behavioural engagement both from moment to moment and from lesson to lesson. However, above expected emotional engagement carried over only within lessons and not between lessons whereas the reverse was true for emotional disaffection. Above expected behavioural and emotional engagement were predicted by heightened perceived competence in the previous occasion on both levels. Further, the relationship between competence and behavioural engagement was reciprocal and heightened emotional engagement was predicted by above expected behavioural engagement on the within-lesson level. These results corroborate previous findings on competence as a facilitator of student engagement on a momentary level and clarify the dynamic relationships between the dimensions of engagement and disaffection.

Intraindividual dynamics between social relatedness and learning engagement
Presenting Author: Simon Ohl, University of Potsdam, Germany; **Co-Author:**Hanna Dumont, University of Potsdam, Germany

The association between social relatedness and students' learning engagement is conceptualized as an intra-individual dynamics (Skinner et al., 2022). However, previous studies have focused on individual differences, leaving aside intra-individual processes (Sinatra et al., 2015). The aim of the present study is to investigate these intra-individual dynamics and their association with a sense of community in the classroom. Experience sampling data of N=457 primary school students, was analysed using dynamic structural equation modelling (Asparouhov et al., 2018). Results show that students' momentary social relatedness predicted learning engagement and social relatedness in the following lesson. A sense of community was associated with those intra-individual processes. The study therefore unveils inter-individual relationships that have been theoretically conceptualized but never empirically tested.

Relevance of perceived teaching quality for students' self-regulation in individual lessons
Presenting Author: Friederike Blume, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Florian Schmiedek, DIPF | Leibniz Institute for Research and Information in Education, Germany

Individuals have been found to differ in their self-regulation (SR), that is, the ability to control, direct, and plan cognitions, emotions, and behaviour. Recently, SR was also found to vary within students from day to day. Aspects of teaching quality (TQ), particularly student support (SS) and classroom management (CM), but not cognitive activation (CA), have been found to explain differences in student SR. However, whether associations between TQ and SR are also evident at the within-person level and with respect to individual lessons is yet to be investigated. Additionally, it was unclear whether students' dispositional SR would moderate these associations. Intensive longitudinal data collected from 11–13-year-olds over 15 school days were analysed using multilevel models. Lesson level SS and CM, but not CA, were associated with SR in individual lessons: in lessons for which students reported higher SS and CM than usual, they also

reported higher SR. Dispositional SR was not found to moderate these associations. Predictors accounted for 55.60% of the total variance in SR. Patterns of associations were largely the same at the between-person level. Findings emphasise the relevance of student-perceived TQ for their SR in individual lessons and suggest that more consideration should be given to students' perspectives. Additionally, they may be considered to suggest the potential of SS and CM to promote SR in individual lessons. Finally, they may be viewed to indicate that TQ is equally important for the lesson level SR of all students.

Session H 8

24 August 2023 08:00 - 09:30
UOM_A02
Symposium
Motivational, Social and Affective Processes

Methods for examining the strategic and timely deployment of SRL processes

Keywords: Educational Technologies, Learning Analytics, Metacognition, Motivation, Science and STEM, Self-regulated Learning and Behaviour
Interest group: SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Allyson Hadwin, University of Victoria, Canada
Discussant: Anastasia Efklides, Aristotle University of Thessaloniki, Greece

During task engagement self-regulation operates in the background, kicking in to direct or redirect regulatory actions as needed. This feature of self-regulation allows attention to be allocated to cognitive demands of the task itself. Put simply, productive learning and collaboration are not defined by the persistent and frequent deployment of regulatory practices and actions throughout a work session. Instead, regulation is about the strategic and timely deployment of strategies or practices when needed. Self-regulating learners are metacognitively primed to recognize and respond when task progress departs from goal standards or unexpected events impede progress. Therefore, it is not surprising that the timing and sequence of observed strategies and actions has become a focus for research about self-, co-, and shared regulation. Contemporary research methods leverage learning analytics, multi-modal data, and conventional methods such as think-aloud and self-report collected over time and across tasks to examine the frequency, timing and sequence of regulatory traces situated in authentic learning activities. In this symposium, presenters have been tasked with answering three main questions in the context of their empirical research: (1) How does this research advance understanding of SRL as a complex and adaptive process? (2) How are multiple data sources leveraged to identify meaningful episodes of self-regulation or shared regulation? (3) How can findings be leveraged to support learners to recognize when and how to strategically deploy regulatory practices?

Trigger events as a framework for empirically evidencing regulation in dynamic learning situation
Presenting Author: Sanna Järvelä, University of Oulu, Finland; **Presenting Author:**Allyson Hadwin, University of Victoria, Canada

This paper introduces *trigger events* as a framework for empirically evidencing modes of regulation (self-regulation, co-regulation, and socially shared regulation) during learning and collaboration episodes. Events and/or situations which may inhibit learning processes and, thus, require regulatory responses are defined as *trigger events*. We argue that trigger events offer a means for conceptually progressing understandings of regulation during complex individual and collaborative learning sessions. Empirically identifying trigger signals in multimodal data as markers for regulation of cognition, motivation, emotion, and behavior has great potential for advancing the field. We explain the theoretical framework of the trigger concept and propose multimodal methodologies for detecting trigger signals by demonstrating how various data modalities respond to the types of triggers following various regulatory responses. We believe the concept of trigger events provides a much-needed conceptual framework for leveraging new methodological opportunities and analytical power to advance research about the situated nature of regulatory responses. This paper strives to present an empirically testable model of trigger events as markers for self-regulated and socially shared regulation of learning with the goal of advancing research about regulation in dynamic and complex learning situations.

Theorized Self-Regulated Learning Events and Sequences and Task Performance During Biology Learning
Presenting Author: Matthew Bernacki, University of North Carolina at Chapel Hill, United States; **Co-Author:**Fatemeh Salehian Kia, Simon Fraser University, Canada; **Co-Author:**Jeff Greene, university of north carolina at chapel hill, United States; **Co-Author:**Linyu Yu, University of North Carolina at Chapel Hill, United States; **Co-Author:**Robert Plumley, University of North Carolina at Chapel Hill, United States; **Co-Author:**Shelbi Kuhlman, University of North Carolina at Chapel Hill, United States

As this symposium emphasizes, self-regulated learning (SRL) processes are not best deployed in volume but rather only at critical moments via strategic efforts cued by the nature of the task, the learner, or their dynamic interaction. Determining those critical moments when SRL is needed, and helping learners know which efforts to enact given the context, requires collecting rich data that can model the cyclical, temporal, sequential, and contingent nature of SRL. In this study, we asked 48 college students to engage in an authentic biology task while thinking-aloud, followed by a posttest assessment of learning. We coded think-aloud verbalizations for SRL processing, resulting in a rich, temporal depiction of SRL processing within the macro-cycle of the task as well as subtask micro-cycles. Transition analyses revealed the most common SRL macro-process and phase contingencies and how they correlated with post-test learning performance. Subsequent regression analyses further refined our understanding of key contingencies and sequences predictive of learning, demonstrating the advantages of modeling SRL as a complex and adaptive process via rich, think-aloud protocol data. Such data produced specific findings regarding which sequential and contingent SRL processes are best targeted for intervention to help learners strategically deploy regulatory practices.

Examining the adaptive nature of self-regulated learning in a large-scale university course
Presenting Author: Mladen Raković, Monash University, Australia; **Co-Author:**Jeff Greene, university of north carolina at chapel hill, United States; **Co-Author:**Matthew Bernacki, University of North Carolina at Chapel Hill, United States; **Co-Author:**Robert Plumley, University of North Carolina at Chapel Hill, United States; **Co-Author:**Kelly Hogan, University of North Carolina at Chapel Hill, United States; **Co-Author:**Abigail Panter, University of North Carolina at Chapel Hill, United States

Even though statistical models that predict student success in a course have achieved considerable prediction accuracy in detecting students who may benefit from intervention, they are typically administered at one time point in a semester and, as such, may fail to inform future efforts to support students who may not initially need or who do not respond positively to an early intervention. Moreover, predictions administered in one time window do not account for adaptation, an aspect of self-regulated learning (SRL) where students refine their learning behaviours over time. In the present study, we investigated whether incorporating multiple predictive models of student success during the semester can advance scholarly understanding of how students adapt their SRL behaviours across learning cycles, and whether those changes in SRL behaviours can predict student success. We collected digital trace data from 474 undergraduate students as they studied using six online learning platforms in an introductory biology course. We identified and labelled relevant trace data to reflect specific SRL processes. We further developed three prediction models using data collected in three different time windows during the semester. These models predicted whether a student was likely to perform poorly on the first exam. We also examined predictive SRL behaviours in each time window and thus provided empirical evidence about the contextual, dynamic, and adaptive nature of SRL. Our results indicate that students who committed effort to understand task requirements at the outset of the semester benefit from this effort on later summative assessments of their knowledge.

Facial expressions and regulation in students completing a collaborative, scenario-based online task
Presenting Author: Matthew Moreno, McGill University, Canada; **Co-Author:**Mariel Miller, University of Victoria, Canada; **Co-Author:**Allyson Hadwin, University of Victoria, Canada; **Co-Author:**Susanne Lajoie, McGill University, Canada; **Co-Author:**Keerat Grewal, McGill University, Canada; **Co-Author:**Reinhard Pekrun, University of Essex, United Kingdom; **Co-Author:**Jason Harley, McGill University, Canada

Examining facial emotion expressions and regulation strategies of 1st year undergraduate students completing a collaborative, scenario-based online taskPurposeResearch has indicated the importance of self-regulated learning (SRL), and socially-shared- regulated learning (SSRL) as instrumental to developing autonomous, engaged learners. What we know far less about is how SRL and SSRL occur in online, collaborative, scenario-based online tasks that incorporate multimodal data to help enhance how learners and researchers see individual and group-regulation occurring. To help address these, this study

asked the following questions:What facial emotions do 1st year undergraduate students express as they complete contrasting questions in a collaborative, scenario-based online task?What differences in self and socially-shared regulation strategies do 1st
year undergraduate students express as they complete contrasting questions in a collaborative, scenario-based online task?MethodParticipants were one-hundred and twenty-eight (n = 128) first-year undergraduate students enrolled in a first-year elective undergraduate course at comprehensive Canadian university. Participants were tasked with completing a collaborative, scenario-based, mid-term exam. During this collaborative mid-term exam, students were given a case-based scenario in which they had to assess the case and answer 10-questions involving analysis of the case as a team, applying principles of learning and regulation they had been taught in class, and then collaboratively justifying their decisions they had made. Participants came from 3 sections of the course and were formed using the principle of homogeneity, with individuals being grouped together according to their performance in the first half of the course, into 23 groups of approximately 4-5 students.Data in the current study included: 1) performance scores on the mid-term exam, 2) audio/visual recordings of the collaborative exam collected via Microsoft Teams for future analysis, and 3) facial emotion detection conducted by FaceReader by Noldus. The research team coded the videos of each team completing their exam using a coding scheme that was adapted to incorporate participant behaviors, SRL, and SSRL codes.
Results
Results from generalized estimating equations from facial emotion analysis indicate that groups have significantly ($p < .001$) differing expressions of questions that require them to collaboratively justify their responses, compared to questions where they need to select a response. When examining SRL codes, there were significant differences ($p < .001$) onjustifying and selection questions, with more codes emerging during section of collaborativejustification. Results indicated that the type of question had a significant effect ($p < .001$) on the number of SSRL strategies of and sence (ISP) codes when required to collaboratively justify their responses, compared to questions where they need to select a response.DiscussionResults from this study suggest that there are differences in the way groups approach collaborative work and SSRL within an online environment. This research advances our understanding of SRL and SSRL as a complex and adaptive process by describing how facial emotion expressions can provide insights into group-regulatory process, when tied to behavioral coding. Multiple data sources, including coding and facial emotion detection software, were leveraged to identify meaningful episodes of self-regulation and shared regulation by analyzing contrasting question types and how they pair together, researchers can hope to better understand how the group needs to make strategic shifts in its group regulation in order to meet the demands of different questioning. By conducting this research in an online environment, it allows researchers and learners to engage in post-areas for improvement as the learn to self-regulate and master their own learning. Finally, these findings can be leveraged to support learners to recognize when and how to strategically deploy regulatory practices by making learners more aware of how their emotions and regulatory practices help to inform their own learning. Having the opportunity to conduct this research within the context of a class dedicated to help newer-learners master SRL and SSRL dynamic can allow future findings to inform practice on how these topics are taught.

Session H 9

24 August 2023 08:00 - 09:30
UOM_A03
Single Paper
Learning and Social Interaction, Motivational, Social and Affective Processes

Social Development in Children and Adolescents

Keywords: Anxiety and Stress, Competencies, Critical Thinking, Developmental Processes, Early Childhood Education, Emotion and Affect, Parents' Beliefs and Affect, Personality, Self-concept, Social Aspects of Learning and Teaching, Social Development, Social Interaction, Well-being
Interest group: SIG 10 - Social Interaction in Learning and Instruction
Chairperson: Josef Guggemos, University of Education Schwäbisch Gmünd, Germany

Linkages between temperament, social skills, and self-concept in childhood
Keywords: Early Childhood Education, Personality, Self-concept, Social Development
Presenting Author: Eleni Kallia, University of Thessaly, Greece; **Co-Author:**Evaggelia Tsiara, University of Thessaly, Greece; **Co-Author:**Irini Dermitzaki, University of Thessaly, Greece

The aim of the present study was to investigate the relations between young children's temperament, their social skills, and aspects of their self-concept. Participants of the study were 171 parents and 108 of their children between 54-89 months old. Children's temperament was examined via a parent-rated scale assessing three dimensions: Effortful control, Surgency/Extraversion, and Negative affectivity. Moreover, parents evaluated children's social skills: Empathy, Emotion management, Emotion adaptability, and Positive social behavior. Self-concept was individually examined for each child by means of a structured interview. Four aspects of self-concept were assessed: Relations to parents, Relations to peers, School self-concept, and General self-concept. Structural equation modeling confirmed that Effortful control significantly contributed to all aspects of children's social skills. Negative effects of Negative affectivity on children's skills for Emotion Management and Emotion Adaptation were also shown. Children's Empathy skills were affected by temperamental characteristics and by children's Self-concept regarding relations to peers. The findings of the study could add to theory and to educational practice aiming at children's optimal development and psychosocial adaptation.

The role of body image to the psychological health and welfare of young students
Keywords: Anxiety and Stress, Developmental Processes, Emotion and Affect, Well-being
Presenting Author: Maria Zafiri, University of Thessaly, Greece; **Co-Author:**Angeliki Leondari, University of Thessaly, Greece; **Co-Author:**Grigoris Kiosseoglou, Aristotle University of Thessaloniki, Greece

Although we live in an era that is mainly defined by ongoing waves of challenge and change, societal preoccupation with appearance and beauty ideals attainment seems to remain a strong and impactful constant in people's everyday lives. Moreover, in school settings worldwide, both discrimination and bullying are often appearance related. Thus, it does not come as a surprise that increasing issues with body image are frequently reported among young students, with often detrimental and potentially lasting effects on their adjustment and psychosocial functioning. We present and discuss data from a study exploring the relationship between body image dimensions (body esteem, body image investment, body dissatisfaction) and psychological health (measures of anxiety, depression, social anxiety, self-esteem, and hope) in 609 Greek 6^{th}, 9^{th}, and 11^{th} Graders, while also investigating the role of internalization of mass-media promoted ideals, demographic characteristics (age, gender, socio-economic status), BMI, and physical exercise. Internalization of mass media-promoted ideals, gender, and BMI were found to have a significant impact on body image, whereas the impact of socio-economic status was not significant, and the effects of physical exercise were limited. Multigroup analyses revealed effects of gender and age on how the relationship between body image dimensions and psychological health is shaped. Moreover, notable connections between specific body image dimensions and psychological health also emerged. We propose the design and implementation of developmentally appropriate prevention and intervention programs for students, targeting at positive body image promotion and, by extension, their overall psychological health enhancement.

Assessing core socioemotional skills in adolescent students: A pilot study
Keywords: Competencies, Critical Thinking, Social Aspects of Learning and Teaching, Social Development
Presenting Author: Rui Maio, Faculty of Psychology and Educational Sciences of the University of Porto, Portugal; **Co-Author:**Ana Camacho, University of Porto, Portugal; **Co-Author:**Catarina Grande, University of Porto, Portugal; **Co-Author:**Teresa Leal, University of Porto, Portugal; **Co-Author:**Diana Alves, University of Porto, Portugal; **Co-Author:**Isabel M.P. Abreu-Lima, University of Porto, Portugal; **Co-Author:**Alan Oliveira, Columbia University, United States; **Co-Author:**Rachel Outhred, Oxford MeasurEd, United Kingdom; **Co-Author:**Joana Cadima, University of Porto, Portugal

Socioemotional skills are key predictors of educational and health-related outcomes. Despite their importance in contemporary societies, there is little research on whether and how teachers assess them in the school context. Aiming to bridge this research gap, in this study, we intended to: a) investigate how Portuguese teachers define, currently assess, and would like to assess three core socioemotional competences in the school context (i.e., empathy, critical

thinking, and ethical decision-making); b) provide teachers with new tools to assess these skills among adolescent students on a regular basis. To that end, we conducted two focus groups with six Portuguese teachers, developed ten school-based dilemmas and short self-report scales to assess students' empathy, critical thinking, and ethical decision-making. We then pilot-tested these tools with 63 Portuguese adolescent students. Findings from the focus groups revealed that teachers value students' socioemotional skills; however, they do not regularly assess them in the school context, nor do they know specific tools to use. Thematic analyses of students' responses to the school-based scenarios showed that most students could identify and acknowledge others' feelings and could come up with appropriate solutions, from basic to advanced, to diverse dilemmas. However, only a few students provided elaborate responses to the scenarios. Finally, Rasch analysis showed that the scales were highly reliable and that the items discriminated well for most students. Overall, this study contributed to further understanding school-based assessments of adolescent students' socioemotional skills and provided a more holistic approach for teachers to assess such skills.

Parenting styles and social behavior of children and adolescents: a latent profile analysis
Keywords: Parents' Beliefs and Affect, Social Development, Social Interaction, Well-being
Presenting Author: Wassilis Kassis, School of Education, FHNW, Switzerland; **Co-Author:**AIKATERINI VASIOU, University of Crete, Greece; **Co-Author:**Anastasia Krasanaki, Hellenic Open University, Greece; **Co-Author:**Spyridon Tandaros, National Kapodistrian University of Athens, Greece

Parenting is considered either risk or protective factor for a series of results related to behavioral problems and well-being of children and adolescents. The aim of this study was to examine the relationship between parenting styles (i.e., authoritarian, authoritative, and permissive) and externalized/internalized problems and prosocial behavior of children and adolescents. By applying a person-oriented latent mixture analysis via latent profile analysis we empirically validated by a sample of 1,203 Greek parents (questionnaire study in 2021) a significant overlap between these parenting styles. By the three introduced parenting styles and the consecutive tests on a different number of profiles (two to six profiles) we identified the four-profile solution as the best fitting. Regarding the distribution of the four profiles, we identified four classes, named highly authoritative style (class 1, 66.6% of the participants), relaxed authoritative style (class 2, 16.3% of the participants), mixed parenting style (class 3, 4.4% of the participants) and authoritarian focused authoritative style (class 4, 12.4% of the participants). The relationships between the four parenting profiles and social behavior of children and adolescents at school supported the insight parenting styles are rather a complex mix than a distinct single parenting style as commonly assumed.

Session H 10

24 August 2023 08:00 - 09:30
AUTH_DC3
Single Paper
Higher Education

Skills and Practices of University Teachers

Keywords: Communication Skills, Communities of Learners and/or Practice, Competencies, Higher Education, Mentoring and Coaching, Quantitative Methods, Social Sciences and Humanities, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 04 - Higher Education
Chairperson: Özün Keskin, University of Augsburg, Germany

Generic skills in higher education - teaching conceptions, practices and pedagogical training
Keywords: Competencies, Higher Education, Teacher Professional Development, Teaching/Instructional Strategies
Presenting Author: Tarja Tuononen, University of Helsinki, Finland; **Co-Author:**Heidi Hyytinen, University of Helsinki, Finland; **Co-Author:**Katri Kleemola, University of Helsinki, Finland; **Co-Author:**Telle Hailikari, Häme University of Applied Sciences, Finland; **Co-Author:**Auli Toom, University of Helsinki, Finland

The present study explored higher education teachers' (N=286) conceptions of generic skills and their pedagogical practices, and how they were related to pedagogical training and teaching experience. We identified three types of conceptions: non-integrative, integrative, and participatory. Non-integrative conceptions related negatively to all pedagogical practices, whereas participatory conceptions related positively to two of them, namely sharing experiences and combining theory and practice. Integrative conceptions did not relate to pedagogical practices. The results also imply that pedagogical training has a significant relation to conceptions and pedagogical practices. We further found that teaching experience did not relate to conceptions of generic skills, but it did to two of the practices, namely combining theory with practice, and reflecting on and utilising feedback. The findings from this study indicate a need for teachers to enhance their awareness of conceptions related to teaching generic skills and highlight the importance of pedagogical training.

Mentoring for student reflection and employability competences: A quasi-experimental study
Keywords: Competencies, Higher Education, Mentoring and Coaching, Quantitative Methods
Presenting Author: Wendy Nuis, Maastricht University, Netherlands; **Co-Author:**Katharina Zimmerling, Maastricht University, Netherlands; **Co-Author:**Mien Segers, Maastricht University, Netherlands; **Co-Author:**Simon Beausaert, Maastricht University, Netherlands

Given the dynamic and fast-evolving labour market, developing students' employability competences has become of utmost importance for higher education institutions. To develop these competences, the ability to reflect is essential, as it helps students to identify their learning needs and make plans for further development. However, reflective abilities are not easy to acquire and students need guidance to help them reflect. Therefore, mentoring is often used as an instructional approach to stimulate students to reflect. When looking at prior research, empirical evidence on the relationship between mentoring and employability competences is scarce, and especially the mediating role of reflection has rarely been researched. Consequently, this quasi-experimental study researched this mediating relationship by employing a pretest-posttest design. Data were collected at four similar mentoring programs in higher education within the Netherlands and Belgium (n = 160). The path analysis demonstrated that, first, trust and availability, autonomy support and empathy significantly increased students' employability competences. Second, it was found that autonomy support and similarity stimulated students' critical reflection significantly. Third, critical reflection significantly influenced students' employability competences. Last, it was found that reflection partially mediated the relationship between mentoring (autonomy support and similarity) and employability. These results demonstrate that mentoring programs in higher education enable students to develop their reflective abilities and, in turn, their employability competences. Furthermore, it provides mentoring program directors and mentors with concrete guidelines on which mentor support types (trust and availability, autonomy support, similarity, and empathy) are most effective for developing students' reflective abilities and employability competences.

Supervision of degree projects: doing collectivity in practice
Keywords: Communication Skills, Communities of Learners and/or Practice, Higher Education, Social Sciences and Humanities
Presenting Author: Jenny Magnusson, Södertörn University, Sweden

In this presentation my aim is to investigate how social and collective aspects of supervision of degree projects come to show in practice, through looking at how supervisors speak of, refer to or give voice to other actors with relevance for the degree project process. The empirical material consists of recorded supervision meetings, which are analysed with the help of concepts like dialogism, scaffolding, attribution and active voicing. The results show that supervisors attribute or give voice to several actors in the supervision interaction. The discussion concerns how the different things they accomplish through doing this, may help the students in the process.

Session H 11

24 August 2023 08:00 - 09:30
UOM_CR
Single Paper

Culture, Morality, Religion and Education

Religiosity and Spirituality

Keywords: Citizenship Education, Cultural Diversity in School, Ethics, Religiosity and Spirituality, Resilience, Well-being
Interest group: SIG 19 - Religions and Worldviews in Education
Chairperson: Dagmar Festner, University of Paderborn, Germany

Children's and young people's value learning, worldviews and resilience in uncertain times
Keywords: Cultural Diversity in School, Religiosity and Spirituality, Resilience, Well-being
Presenting Author: Arniika Kuusisto, University of Helsinki, Finland

This presentation focuses on children's and young people's values and value learning trajectories, and the role of educational institutions from Early Childhood Education and Care (ECEC) to upper secondary schools in guiding their worldview construction. The topic is particularly relevant in the present sociopolitical world situation and the trajectories of constructing existential resilience and well-being during childhood and youth. Resilience has a central role in maintaining sustainable well-being in crises or difficult situations such as pandemics, and at present, not only the pandemic and climate crisis but also the war have contributed to many children and youths' existential anxiety.
The empirical and conceptual developments presented derive from two research projects, both funded by the Academy of Finland. Namely, (1)*Technology Assisted Multi-Method Autobiographical Approach to Value Learning during Transition to School* (ages 3-8, N=42 digital audiovisual autobiographical accounts and life history interviews, T1-T3, and puppet survey on values), which was carried out in Finnish ECEC and comprehensive school, and *(2) Growing up radical? The role of educational institutions in guiding young people's worldview construction* (ages 16-19, N=4025 survey; N=1667 written exam accounts; N=45 in-depth interviews).
The presented findings contribute to further understanding of children's and youths' values, world views, resilience and well-being, as well as their views on the elements influencing their value learning and worldview development trajectories. The aim was also to bring new insights and methodological openings into the field. Besides advancing the knowledge in this interdisciplinary field, the findings have important contributions to policy and practice.

Finnish ethnic minority youth and inspiration from religion for civic engagement
Keywords: Citizenship Education, Cultural Diversity in School, Ethics, Religiosity and Spirituality
Presenting Author: Anuleena Kimanen, University of Turku, Finland; **Co-Author:**Samaneh Khalili, University of Turku, Finland; **Co-Author:**Aleksi Seger, University of Turku, Finland; **Co-Author:**Jenni Alisaari, University of Turku, Finland; **Co-Author:**Elina Kilpi-Jakonen, University of Turku, Finland

Several European and U.S. studies show that religious affiliation is in connection with higher civic engagement, especially for immigrant-background Muslims. Civic engagement covers both participation in formal associations and informal action for common good. Critical agency, defined as the recognition of oneself as an actor in the society is an important factor behind civic engagement. We have interviewed ethnic minority youth aged 15–19 in a Finnish neighbourhood with high cultural diversity about their social and civic engagement. In our study we ask how religion as beliefs and as a community supports or restricts the interviewees' critical agency. A qualitative content analysis on the data shows that the local religious communities provide both ethical inspiration and possibilities for volunteering. However, the activities are led by adults, and the young people mainly serve in fulfilling certain tasks. Sometimes religion also restricted participation in youth-initiated activities that were considered to be foreign to Islam like Halloween. These insights show opportunities that probably are not fully recognized in religious and civic education. The civic potential of religion and religious communities could be addressed in religious and civic education, and pupils' experiences in their religious communities could be used as examples of civic engagement. Furthermore, education on one's own religious tradition would give the young people tools to negotiate issues in their own religious communities.

Session H 12

24 August 2023 08:00 - 09:30
UOM_R05
Single Paper
Learning and Instructional Technology, Teaching and Teacher Education

Teachers' Technological-Pedagogical Knowledge and Use of Educational Technologies

Keywords: Computer-assisted Learning, Cooperative/Collaborative Learning, Digital Literacy and Learning, Educational Technologies, In-service Teachers, Instructional Design, Learning Analytics, Self-regulated Learning and Behaviour, Teacher Effectiveness, Teacher Professional Development
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Aki Schumacher, Germany

How teachers use digital data: A systematic review
Keywords: Educational Technologies, Instructional Design, Learning Analytics, Teacher Professional Development
Presenting Author: Alina Hase, Leuphana University Lueneburg, Germany; **Presenting Author:**Franziska Greiner, Universität Leipzig, Germany; **Co-Author:**Poldi Kuhl, Leuphana Universität Lüneburg, Germany

Digitalization is currently becoming more important in everyday life; also in the educational domain. When used in schools, digital media potentially provide great benefits, for example, because of the student learning data collected, especially for teachers' individualized, differentiated instruction and consequently also better achievement of students. In this systematic review, we give an overview of the current evidence on digital data-based development of teaching. Based on a literature search in FIS-Bildung, Psyndex, Scopus, and Web of Science, we identified 28 empirical studies addressing the question to what extent the current research discourse on data-based decision making already refers to data from digital media. In this systematic review, on the one hand, we provide a methodological classification of the papers. On the other hand, we analyzed the types of used digital media and data, the reasons for using the data and their effects on teaching. Finally, we discuss our findings and implications for educational research and practice.

Teachers' Technological-Pedagogical Knowledge, computer use in class, and students' ICT
Keywords: Computer-assisted Learning, Educational Technologies, In-service Teachers, Teacher Effectiveness
Presenting Author: Karsten Stegmann, University of Passau, Germany; **Co-Author:**Tamara Kastorff, Technical University of Munich, Germany; **Co-Author:**Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

A systematic facilitation of Technology-related Pedagogical Knowledge (TPK) is seen as key to successful digitization of teaching in schools. It is expected that that teachers with higher TPK, use digital media more often in the classroom to implement and enable constructive and interactive learning activities (in the sense of the ICAP model) and less often for passive and active learning activities. So far, there has been a lack of empirical findings relating TPK to quality of digitally supported teaching and ICT literacy of learners. The present study aims to answer following research questions: (RQ1) To what extent can teachers' TPK predict students' ICT literacy? (RQ2) To what extent can the extent of the use of computers in the classroom, the ICAP-level of classroom activity, and the interaction thereof predict students' ICT literacy? Analyses regarding RQ1 did not reveal any significant effect regarding teachers' TPK and students' ICT Literacy. Results regarding RQ2 show a small negative effect of the use of computers in the classroom. The ICAP-level 'passive' of classroom activity, and its interaction with the use of computers in classroom, showed small negative effects on students' ICT literacy. The ICAP-level 'active' of classroom activity, and its interaction with the use of computers in the classroom, showed small negative effects on students' ICT literacy. The effects of ICAP level of classroom activity and its interactions with the computer use in class further emphasises the need of TPK on part of the teachers to use digital media in a pedagogically meaningful way.

Relation between Teachers' Pedagogical Knowledge, Classroom Activities and Self-Regulated Learning

Keywords: Digital Literacy and Learning, In-service Teachers, Self-regulated Learning and Behaviour, Teacher Professional Development
Presenting Author: Karsten Stegmann, University of Passau, Germany; **Co-Author:**Sabrina Reith, Technical University of Munich, Germany; **Co-Author:**Tamara Kastorff, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Stefan Ufer, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Birgit J. Neuhaus, LMU Munich, Germany; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany

In this study we investigate the relation between teachers' pedagogical knowledge, classroom activities and knowledge on SRL with digital media. Self-regulated learning (SRL) with digital media is expected to be positively related with learning, but requires knowledge on SRL with digital media. To facilitate knowledge on SRL with digital media, classroom activities may offer opportunities apply and train their knowledge on SRL with digital media. Consequently, knowledge about SRL with digital media is both, a learning goal as well as a learning prerequisite. The ICAP-model differentiates four levels of observable classroom activities which offer different extent of opportunities for self-regulation. The following research question was formulated: To what extent do teachers' Pedagogical Knowledge (PK) and ICAP-levels of classroom activities predict knowledge about SRL with digital media? In Autumn 2021 $N = 2{,}416$ Bavarian (Germany) 8^{th} Grade students from $N_{classes} = 135$ classes and $N_{schools} = 39$ schools as well as $N = 161$ teachers participated in a survey study. Schools were selected randomly and participated voluntarily. Teachers' pedagogical knowledge (PK) has a significant medium positive effect on students' knowledge about SRL with digital media. Significant effects of ICAP-levels of classroom activities on students' knowledge about SRL with digital media were found. The effects, however, were different between Math classes and Science Classes. The results provide evidence for a substantial relation between students' knowledge about SRL with digital media and classroom activities. Due to the cross-sectional design of the study, however, the direction of effects cannot be determined.

Structural Conditions of Professional Learning Communities on Educational Technologies
Keywords: Cooperative/Collaborative Learning, Educational Technologies, In-service Teachers, Teacher Professional Development
Presenting Author: Sonja Berger, Ludwig-Maximilians-Universität in Munich, Germany; **Co-Author:**Andrea Ludwig, ISB - State Institute for School Quality and Educational Research Munich, Germany; **Co-Author:**Pauline Woop, Ludwig-Maximilians-Universität in Munich, Germany; **Co-Author:**Vera Haldenwang, ISB - State Institute for School Quality and Educational Research Munich, Germany; **Co-Author:**Markus Teubner, ISB - State Institute for School Quality and Educational Research Munich, Germany; **Co-Author:**Karsten Stegmann, Ludwig-Maximilians-Universität in Munich, Germany

Which structural barriers in schools must be overcome to build successful Professional Learning Communities (PLCs) of teachers? This interview study examines school-internal structural conditions for successful establishment of PLCs in secondary education to expand insights into the functioning of teacher collaboration in Germany. 24 participants from four secondary schools participating in a federally funded project were interviewed about their experience with building a PLC at their school to improve their use of educational technologies. Our findings support previously investigated structural conditions at schools and extend them. Voluntariness as well as material, spatial and time resources were found to be essential for a teacher PLC to thrive. These results can support decision-making in educational administration when introducing PLCs.

Session H 13

24 August 2023 08:00 - 09:30
AUTH_T202
Single Paper
Lifelong Learning, Motivational, Social and Affective Processes, Teaching and Teacher Education

Curriculum Development: Students, Teachers, Principals

Keywords: Attitudes and Beliefs, Competencies, Curriculum Development, Digital Literacy and Learning, Educational Policy, Parental Involvement in Learning, Pre-service Teachers, Quantitative Methods, School Leadership, Self-efficacy, Teacher Professional Development
Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development
Chairperson: Caroline Cohrssen, University of New England, Australia

Effective career orientation and career counselling in secondary education: a review study
Keywords: Attitudes and Beliefs, Curriculum Development, Parental Involvement in Learning, Self-efficacy
Presenting Author: Hanke Korpershoek, University of Groningen, Netherlands; **Co-Author:**Merlijn Karssen, Kohnstamm Institute, Netherlands; **Co-Author:**Alma Spijkerboer, University of Groningen, Netherlands; **Co-Author:**Regina Petit, Kohnstamm Institute, University of Amsterdam, Netherlands; **Co-Author:**Annet Hermans, independent, Netherlands

In career guidance at school, orientation to subsequent education and vocational orientation should come together. This literature study investigated which approaches to *career orientation and counselling* could be effective for 12-16 years old adolescents. The 69 studies included in the final sample were published in peer-reviewed journals between 2000-2020. We mainly relied on (quasi-) experimental research in which pre- and post-measurements and partly also control groups were used to evaluate the effectiveness of a career guidance intervention, programme, or activity. We considered career guidance to be effective when it positively influenced adolescents' career development, e.g., more confidence in making suitable career choices or better insight into their own interests and capacities. We synthesized seven elements that can contribute to effective career guidance and the study and career choice process of young adolescents: (1) the activity is connected to practice (e.g., jobs), (2) the student has an active role in the activities, (3) the activity is linked to school / part of a coherent set of career guidance activities, (4) reflection on the activity before ánd after the activity takes place, (5) parents are involved, (6) attention is paid to dealing with expectation patterns (incl. parental expectations, stereotyping, discrimination), and (7) attention is paid to knowledge acquisition to progress students' self-efficacy and vocational interests.

Towards a curriculum targeting teachers' relationship-building competence: Results of a Delphi study
Keywords: Competencies, Curriculum Development, Pre-service Teachers, Teacher Professional Development
Presenting Author: Liedewij Borremans, KU Leuven, Belgium; **Co-Author:**Jantine Spilt, KU Leuven, Belgium

Although teachers often refer to their personal relationships with students as a motivating and fulfilling part of their job, they also report that building these relationships is one of the most difficult aspects of teaching. This study aimed to investigate which competencies beginning teachers need to gain in pre-service education in order to successfully build relationships with individual students. Using the Delphi method, 36 competencies were identified as 'need to know' by an expert panel consisting of teacher educators and researchers. The inclusion of international experts supports the international relevance of the study results. The selected 'need to know' competencies were structured into five categories: the importance of teacher-student relationships for students, key concepts to understand and describe teacher-student relationships, attitudes and self-reflection, specific strategies to establish and maintain relationships, and building relationships in the context of student diversity. For most competencies, an intermediate level of mastery was expected at the end of pre-service teacher education. Results of the study can inspire pre-service teacher training as well as professional development initiatives.

Mapping the main streams and foci of competence-based education research
Keywords: Competencies, Curriculum Development, Educational Policy, Quantitative Methods
Presenting Author: Joonas Mannonen, Finnish Institute for Educational Research, University of Jyväskylä, Finland; **Co-Author:**Felipe Urrutia Vargas, Universidad de Chile, Chile; **Co-Author:**Raija Hämäläinen, University of Jyväskylä, Finland; **Co-Author:**Roberto Araya, Universidad de Chile, Chile; **Co-Author:**Sami Lehesvuori, University of Jyväskylä, Finland

Competence-based education (CBE) has been one of the most widespread trends in education in the 21^{st} century. Yet, recent review articles suggest that there is still notable confusion around CBE and its theoretical conceptualization. To better understand the scientific landscape of this growing research domain, we employed a bibliometric analysis to identify the main streams of CBE research and their most influential articles. Next, we performed topic analysis with latent

semantic approach to explore the topics that the research streams have covered to date. We found three main streams of CBE research: the higher education stream, the vocational education and training stream, and the basic (primary and secondary) education stream. Based on the topic analysis, we present six main topics for each research stream. Our preliminary findings suggest that the higher education stream is trending the most with key competencies in sustainability as its most dominant topic. Our research contributes to a better understanding of the CBE research domain and its foci by visualizing the knowledge transfer in the domain and exploring the topics that have been covered to date. It can be used as a starting point to further manual qualitative analysis aiming to determine how competences are defined in the different CBE research streams.

Shifting technology leadership practices in a curriculum reform in Switzerland
Keywords: Curriculum Development, Digital Literacy and Learning, Educational Policy, School Leadership
Presenting Author: Thomas Wicki, PHBern, University of Teacher Education, Switzerland

This study engages in the implementation of media and information literacy (MIL) in elementary schools in German-speaking Switzerland. We focus on the three key functions of leadership postulated by Leithwood et al. (2020) - setting directions, developing people and developing the organisation - that were adapted to technology leadership practices by Dexter (2018). We argue that ICT coordinators (ICTC) as new actors in the field may manage the implementation process by overtaking certain technology leadership practices. We are specifically interested in the question of who takes over which technology leadership practices in schools and if there are any patterns of distribution of these practices. The mixed-methods research design consists of a quantitative cluster analysis (Ding & He, 2004) based on questionnaires answered by school principals (n=30) and ICTC (n=29) about technology leadership practices and a qualitative content analysis (Kuckartz, 2018) based on interviews with school principals (n=30) and ICTC (n=29) about their experience and role in the implementation process. As a result, we will be given an understanding of which practices formal school leaders are willing to share with ICTC and if these practices are consistent with the three key functions of leadership.

Session H 14

24 August 2023 08:00 - 09:30
UOM_A13
Single Paper
Learning and Instructional Technology

Educational Technologies for Children

Keywords: Computer-assisted Learning, Digital Literacy and Learning, Early Childhood Education, Educational Technologies, Eye Tracking, Foreign and Second Language Acquisition, Goal Orientations, Instructional Design, Migrant / Refugee and Minority students, Multimedia Learning, Primary Education, Science and STEM, Tool Development
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Xavier Fontich, Autonomous University of Barcelona, Spain

Digital competence in Swedish preschools
Keywords: Digital Literacy and Learning, Early Childhood Education, Educational Technologies, Multimedia Learning
Presenting Author: Anna-Lena Godhe, Jönköping University, Sweden

Digital competence was a few years ago added to the preschool curricula in Sweden, as something that children should have the opportunity to develop in preschool. This presentation aims to explore how preschool teachers define digital competence for themselves and the children, as well as the activities that children in preschool engage in to develop their adequate digital competence. Interviews with teachers and observations of groups of children at three different preschools, reveal that digital competence in these preschools connect to and expand stories and texts, such as fairy tales. With the use of digital resources, preschool teachers can engage the children in different stories, but they also use digital resources to develop children's critical attitude to digital information. The observed activities align well with the goals stipulated in curricula and contradict some of the fears expressed when digital competence was included in the preschool curricula.

A PlanningApp to help Children Make and Internalize Plans: A Case for Personalized Technology
Keywords: Computer-assisted Learning, Educational Technologies, Goal Orientations, Instructional Design
Presenting Author: Jasmin Breitwieser, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Daniel Biedermann, German Institute for International Educational Research (DIPF), Germany; **Co-Author:**Lea Nobbe, German Institute for International Educational Research (DIPF), Germany; **Co-Author:**Hendrik Drachsler, Goethe-Universität Frankfurt, Germany; **Co-Author:**Garvin Brod, German Institute for International Educational Research (DIPF), Germany

How should we best design an educational app that helps children create and internalize plans? The successful implementation of a plan requires that the plan is retrievable in everyday life when it is needed. Children in particular are unlikely to use effective strategies to internalize plans in a way that makes them easy to remember. In the current study, we compared different internalization activities that were hypothesized to promote deeper or shallower processing of plans. School-aged children (N = 106, 9-14 years) used a smartphone app for 27 days in their daily lives. Contrary to our hypotheses, the type of internalization activity was not associated with memory success overall. Instead, there were vast individual differences in what activity worked best for a particular child. These individual differences were predicted by children's grade level and their analogical reasoning abilities and mediated by time on task. Findings suggest that a child-appropriate planning app needs to be personalized to be effective; internalization activities have to be tailored to children's learning prerequisites.

Creating a communication bridge for refugee children's education with the eMascot
Keywords: Educational Technologies, Foreign and Second Language Acquisition, Migrant / Refugee and Minority students, Tool Development
Presenting Author: Charikleia Sparou, Radboud University, Netherlands; **Co-Author:**Caroline Pelletier, University College London, United Kingdom; **Co-Author:**Inge Molenaar, Radboud University, Netherlands; **Co-Author:**Manolis Mavrikis, UCL Knowledge Lab, United Kingdom

This research was conducted to address the communication issues teachers and refugee children face. The government of the host country is responsible for refugee children's education. However, in some countries, the teaching and learning of the host country's language as a mother tongue is promoted, excluding the refugees' mother tongue. The eMascot, an educational technology (EdTech) tool developed in previous research, was used. Firstly, the study aims to investigate how the eMascot facilitates communication between stakeholders in a multilingual educational context. Also, the study applies a design-based research method with 3 cycles to improve the eMascot tool and its usage to meet both the learners' and the teachers' needs. This qualitative research was conducted with 34 children, recruited by the International Organization for Migration (IOM), and the public kindergarten, based in a refugee camp in Greece. Through co-teaching activities using the eMascot, observations and an interview with the teachers were made. The observations were about children's interaction with the eMascot, Greek learning, and their involvement in the activities. The research showed that the communication between students and teachers was eased and switched from non-verbal to verbal. All stakeholders started using, increasingly, the words translated by the eMascot during the activities. The alterations made to the tool helped to increase students' interaction with the tool and the teachers. Consequently, using the tool as a translator in the refugee camp's educational settings increased students' initiative in verbal communication, social interactions and facilitated Greek language learning.

Integrative processes in primary school children during AR-supported lab work: An eye-tracking study
Keywords: Educational Technologies, Eye Tracking, Primary Education, Science and STEM
Presenting Author: Kristin Altmeyer, Saarland University, Germany; **Co-Author:**Michael Barz, German Research Center for Artificial Intelligence (DFKI), Germany; **Co-Author:**Sarah Malone, Saarland University, Germany; **Co-Author:**Luisa Lauer, Saarland University, Germany; **Co-Author:**Jochen Kuhn, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Markus Peschel, Saarland University, Germany; **Co-Author:**Daniel Sonntag, University of Oldenburg,

Germany; **Co-Author:**Roland Bruenken, Saarland University, Germany

Following the Cognitive Load Theory and the Cognitive Theory of Multimedia Learning, Augmented Reality (AR) can be used to reduce the spatial split that often concerns virtual and real information in lab work-bases learning scenarios. AR is expected to thereby support coherence formation processes that promote learning through experimentation. Although integrative gaze behavior has already shown to give valuable insights into these processes, it has rarely been investigated for AR-based learning environments. The present research compared AR-supported lab work to lab work without AR in terms of integrative gaze behavior and tried to link it to performance measures. Results showed that AR-support reduced transitions between virtual and real representations. Moreover, the number of transitions was negatively related to several learning outcomes, indicating that they displayed resources-consuming search-processes. These process-level findings can help to improve the design of future AR-based learning environments to promote coherence formation processes.

Session H 15

24 August 2023 08:00 - 09:30
UOM_A05
Single Paper
Higher Education, Learning and Instructional Technology, Lifelong Learning

Self-regulated Learning in Online Settings

Keywords: Assessment Methods, Computer-assisted Learning, E-learning/ Online Learning, Educational Technologies, Higher Education, Informal Learning, Learning Analytics, Quantitative Methods, Science Education, Self-regulated Learning and Behaviour
Interest group: SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Ester Miquel, Universitat Autonoma de Barcelona, Spain

Students' Self-Regulated Activities While Working on an Online Task-based Instruction in Physics
Keywords: Computer-assisted Learning, Higher Education, Science Education, Self-regulated Learning and Behaviour
Presenting Author: Claudia von Aufschnaiter, Insitute of Physics Education, Germany; **Co-Author:**Alexander Eitel, University of Giessen, Germany; **Co-Author:**Jonas Gabi, Justus Liebig University Giessen, Germany; **Co-Author:**Anna Kienitz, Justus-Liebig-Universität Giessen, Germany; **Co-Author:**Joachim Stiensmeier-Pelster, Justus Liebig University Giessen, Germany; **Co-Author:**Andreas Vorholzer, Technical University of Munich, Germany; **Co-Author:**Julius Weckler, Justus Liebig University Giessen, Germany

Self-Regulation plays an important role for using online learning environments effectively. This study explores self-regulated activities of physics students in a task-based, non-linear online learning environment on Newtonian mechanics. Furthermore, we explore how these activities are related to students' dispositions and how dispositions and activities affect learning gains. The study employs a one-group pre-post design; the treatment comprises two 90-minutes learning sessions within the online learning environment. The learning environment comprises six units on different topics (e.g., basis properties of forces, multi-force systems), different elements (e.g., explanations, tasks on three levels of difficulty, self-assessments). Data collected comprises students' content knowledge (pre- and posttest), self-regulation strategies, interest in physics, goal orientation, self-efficacy, and contingent self-esteem (pretest only). Self-regulated activities are assessed with log files of students' navigation in the environment, their solutions of tasks, their answers to self-assessments and short questionnaires about their experiences. Results show significant learning gains for all students. Interestingly, these gains are only correlated with students work avoidance, not with their prior knowledge or with any other disposition assessed in the pretest. Analysis of the activities indicate two profiles but no clear relationship between individual activity patterns and learning gains.

Learning from data: using learning analytics to support self-regulated learning
Keywords: E-learning/ Online Learning, Higher Education, Learning Analytics, Self-regulated Learning and Behaviour
Presenting Author: Silvia Lipp, University of Graz, Austria; **Presenting Author:**Susanne Kamsker, University of Graz, Austria

Due to digitalization, opportunities for technology-enhanced learning environments are steadily increasing. As a result, the volume of data generated from these learning environments is also growing. Using this educational data is the goal in the research field of learning analytics. Learning analytics is the description, analysis, and interpretation of data produced using digital learning environments to improve learning processes. While technical issues dominate current discourses in the research field, this paper addresses learning analytics regarding self-regulated learning, taking a pedagogical point of view. After a brief introduction to the research field of learning analytics, a research project on learning analytics carried out at the Austrian University of Graz since January 2020 will be presented. Within this project, learning analytics was implemented in two blended learning courses in the master's program in Business Education and Development. A learning analytics dashboard was used to give learners access to their data and support their learning. The research on this application scenario aimed to determine how learners perceived support for self-regulated learning by using learning analytics. The study focuses on the past two semesters (October 2021 to June 2022), during which written questionnaires, learning journals, and group discussions were conducted with a total of 113 students. The results show that students perceive support in their self-efficacy and learning motivation using learning analytics dashboards. Based on the study's result, opportunities, challenges, and practical implications for the further use of learning analytics in education are derived.

Student self-regulated learning in online assessments
Keywords: Assessment Methods, Educational Technologies, Higher Education, Self-regulated Learning and Behaviour
Presenting Author: Tiffani Apps, University of Wollongong, Australia; **Presenting Author:**Karley Beckman, University of Wollongong, Australia; **Co-Author:**Sue Bennett, University of Wollongong, Australia; **Co-Author:**Lori Lockyer, Queensland University of Technology, Australia

The transition to study in higher education is complex and marks a period of uncertainty for many students. This was further complicated as teaching and learning pivoted to modes of emergency online delivery throughout the Covid-19 pandemic. For many institutes the pandemic accelerated an existing agenda to move to increasingly flexible modes of online and blended delivery. Importantly, these modes of delivery require students to navigate flexible online learning tasks and independently self-regulate their learning. The aim of this research was to extend fundamental understanding of online and blended learning at university. The mixed methods study was conducted across four Australian universities prior to the Covid-19 pandemic. The research used an embedded, multiple case study design. The case studies comprised ten first year units of study that involved an online or blended assessment task, including the educator and student cohorts, as well as individual student cases selected from the broader sample. A total of 24 teaching staff and 1167 students participated in the study with 113 embedded student cases. Data was collected through questionnaires, learning management system log data, assessments, as well as interviews with educators and student cases. We present findings about the challenges students experience across online and blended modes of learning and their approaches to task understanding and goal setting across the task period. We discuss the implications of these findings to support students through online and blended learning in light of the issues raised across the pandemic.

Who keeps up? Predicting persistence in non-formal online courses using machine learning
Keywords: E-learning/ Online Learning, Informal Learning, Quantitative Methods, Self-regulated Learning and Behaviour
Presenting Author: Maria Klose, Leibniz Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:**Philipp Handschuh, Leibniz Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:**Diana Steger, University of Kassel, Germany

The ongoing shift towards online learning also effects non-formal learning, visible through increasing numbers of online learning opportunities and a broad user community. However, completion rates tend to be low. In this study, we aim to predict persistence from users of non-formal online courses to identify learner-centered and course-centered characteristics that have an impact on a persistent learning behavior. Analyses were based on 1414 participants between age 16 and 84 who enrolled in one of 51 online courses from Bavarian universities that were freely accessible for everyone. As independent variables, we used learner characteristics from questionnaire data (i.e., demographic information, enrollment intentions, and motivational variables) and extracted course characteristics

from the online courses (e.g. course extent, course content, or type of assessment). The preliminary results of elastic net regressions displayed that 15% of the variance in persistence could be explained by learner and course characteristics, and the degree of overfitting was rather low ($\Delta R^2 = .04$). We identified variables that should be considered when predicting persistence in non-formal online courses, indicating in particular an important role of enrollment intentions for learner characteristics, and the percentage of correct self-testing required for a confirmation of participation for course characteristics. Eventually, we want to derive implications for improving course design decisions and recommendations for possible interventions for maintaining motivation.

Session H 16

24 August 2023 08:00 - 09:30
UOM_A11
Single Paper
Culture, Morality, Religion and Education, Educational Policy and Systems, Learning and Social Interaction, Teaching and Teacher Education

Curriculum Development in Early Childhood Education

Keywords: Attitudes and Beliefs, Curriculum Development, Early Childhood Education, Educational Policy, Morality and Moral Development, Primary Education, Qualitative Methods, Social Aspects of Learning and Teaching, Teacher Professional Development
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 13 - Moral and Democratic Education
Chairperson: Wolfram Rollett, University of Education Freiburg , Germany

Strategies to Promote Character Strengths Education in ECE Setting: A Scoping Review
Keywords: Curriculum Development, Early Childhood Education, Morality and Moral Development, Primary Education
Presenting Author: Cheuk Ming Ho, The Education University of Hong Kong, Hong Kong

Character strengths are key drivers of well-being and socio-emotional development. However, past studies on character strength interventions have mainly been conducted on adolescents and young adults. Not much work has focused on younger children, such as those in preschool and lower primary school. Hence, this scoping review aims to survey the different intervention studies that targeted the promotion of children's strengths. In this scoping review, we followed the framework proposed by Arksey and O'Malley and the protocol suggested by Peters et al. From a total of 13,135 articles, and twenty-nine papers were considered suitable. The majority of research is done in Western countries (20 out of 29). Seven out of twenty-nine studies focused on preschool students. Another eighteen studies focused on lower primary school students, and another 4 studies focused on both preschool and lower primary school students. Most of the interventions were using the pre-existed program (16 out of 29). Three interventions introduced characters to the young children through storytelling. Puppet shows, movies, computer games, music, and Martial arts were also used as the primary pedagogical tool in the intervention. We recommend further studies to fill the evidence gap in other regions, such as Asia and Africa. Furthermore, researchers can use only one strategy in the intervention design to examine the effectiveness of each strategy in promoting character education in early childhood. Research is also needed to examine the stage of implementation of character education and the components that affect its effectiveness, such as school leadership and professional development.

Teachers' personal interests: Do they have a place in early childhood curriculum?
Keywords: Curriculum Development, Early Childhood Education, Social Aspects of Learning and Teaching, Teacher Professional Development
Presenting Author: Maria Birbili, Aristotle University of Thessaloniki, Greece

Despite the extended literature on how teachers' personal experiences and knowledge interact with curriculum and life in classroom there is still an empirical gap on how teachers' personal interests find – or not – their way into the curriculum. Early childhood education is a particularly interesting context for exploring teachers' personal interests as a source of curriculum because the concept of children's interests dominates discourses on young children's curricula. With contemporary discussions on the most effective pedagogy for young children drawing their arguments from theories and approaches which prioritize identities and relations (e.g., Funds of Knowledge and Relational Pedagogy), it is time to revisit teachers' contribution to what is taught in classroom: Do teachers' personal interests have a place in the early childhood curriculum? The presentation will discuss the findings of a qualitative study which aimed to explore early childhood teachers' views on the role their personal interests can play in the enacted curriculum. The results suggest that teachers may resist the idea of bringing their interests in the classroom based on the perception that such a practice seems incompatible with child-centered education. Their resistance also seems to be linked to a conceptualisation of the term 'teacher's personal interests' as the topics they decide to teach children and not as their own relatively stable affective-evaluative orientation toward certain subject areas, objects, or activities. The results are discussed through the perspective of relational pedagogy and the presentation concludes that teacher professional learning needs to pay explicit attention to the concept of teachers' interests.

Aspects of learning in kindergarten: Listening to children's voices through photo-voice
Keywords: Attitudes and Beliefs, Curriculum Development, Early Childhood Education, Social Aspects of Learning and Teaching
Presenting Author: Maria Kanaki, Aristotle University of Thessaloniki, Greece; **Co-Author:**Maria Papandreou, Aristotle University of Thessaloniki, Greece

Discussion on learning in early childhood education (ECE) is growing globally. This study focuses on children's views of their learning experience in ECE settings. It derives from a larger, multiple-case, research which sought to investigate different aspects of learning from children's and other stakeholders' perspectives in the Greek context. The overall project is drawn on a participatory research perspective, which acknowledges young learners as competent actors and expert informants in research and value their views. Thus, for data collection, a multi-method approach was used, including visual methods. For this presentation, the findings from the photo-voice process with 35 kindergarteners (4-6 years old) were analysed and discussed. Thematically analysed, children's accounts (verbal and visual) suggest that they have rich ideas about the learning process in ECE settings. Specifically, data analysis uncovered their perspectives on a) what and how they learn in their classrooms, b) teachers' and peer's roles in the learning process and c) play-learning relationship. In addition, photo-voice was confirmed, once again, as a valuable method in early years research. The discussion supports the argument that young children must be considered as active participants in their learning process, highlighting the need to ensure their views inform practice in ECE. The implementation of the doctoral thesis was co-financed by Greece and the European Union (European Social Fund-ESF) through the Operational Programme «Human Resources Development, Education and Lifelong Learning» in the context of the Act "Enhancing Human Resources Research Potential by undertaking a Doctoral Research" Sub-action 2: IKY Scholarship Programme for PhD candidates in the Greek Universities.

The inclusion and importance of workshops in Early Childhood Education
Keywords: Curriculum Development, Early Childhood Education, Educational Policy, Qualitative Methods
Presenting Author: Alexandros Mokias, 2nd Public School of Atalanti Fthiotidas, Greece; **Presenting Author:**Spyridon Filippou-Filippis, University of Thessaly, Department of Early Chlidhood Education, Greece; **Presenting Author:**Anastasios Siatras, University of Thessaly, Greece

The purpose of the paper is to investigate the inclusion of the social dimension of knowledge in Early Childhood Education, through the critical analysis of the thematic unit "I am interested and active - Social Awareness & Responsibility" of the Skills Cultivation Program of the Educational Policy Institute. Curriculum research contributes to critical reflection on the educational process for the holistic development of children, with the goal of building attitudes and practices that empower democratic citizenship. In the context of qualitative research, in this work a content analysis is carried out based on four (4) axes: conceptual content, nature of content, scientific methods and socio-scientific issues. Taking into account the relevant literature on these four (4) axes, the interaction between the "discourse" of abstract academic concepts and the "discourse" of everyday practical experiences is explored. More specifically, for the purposes of the work, eleven (11) thematic sections were analyzed, which were divided into seven (7) workshops each. The learning objectives included in each workshop are classified in the four (4) axes of analysis based on the effect they are expected to have on the active involvement of young children. Finally, the presentation of the results of the work will contribute to the interdisciplinary presentation of knowledge that allows each child to develop social aspects cultivating the values of cooperation, respect and empathy.

Session H 17

24 August 2023 08:00 - 09:30
AUTH_T102
Single Paper
Teaching and Teacher Education

Teacher Education Programmes

Keywords: Attitudes and Beliefs, Curriculum Development, Developmental Processes, Educational Policy, Higher Education, Mixed-method Research, Pre-service Teachers, Qualitative Methods, Quantitative Methods, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Lida Zoi David, University of Twente, Netherlands

Exploring the coherence of teacher education programmes via a mixed methods approach
Keywords: Curriculum Development, Pre-service Teachers, Qualitative Methods, Quantitative Methods
Presenting Author: Katharina Hellmann, University of Education Freiburg, Germany; **Presenting Author:**Michelle Laux, PH Freiburg, Germany; **Co-Author:**Vasileios Symeonidis, University of Education Freiburg, Germany; **Co-Author:**Mirjamaija Mikkila-Erdmann, University of Turku, Finland; **Co-Author:**Norbert Erdmann, University of Turku, Finland; **Co-Author:**Julia Nummi, University of Turku, Finland

The concept of coherence remains vaguely defined in the context of teacher education, although it bears the potential to help overcome issues of fragmentation. This study aims to examine coherence in teacher education programmes at both levels of policy and practice, in an attempt to holistically improve our understanding of the concept. Specifically, the study envisages to map policies and practices related to coherence in teacher education programmes across different countries, as well as to investigate student teachers' perceptions of coherence in two Finnish universities. Data are gathered via a mixed methods approach, through a qualitative survey that looks at organisational characteristics of teacher education programmes across five European countries, and a quantitative survey with Finnish master's level student teachers (N = 126) that examines their perceptions of the concept. Both qualitative and quantitative findings suggest that there is increasingly a coherent structure among teacher education programmes in Europe, while Finnish student teachers perceive their programme to be rather coherent.

Bachelor's and master's thesis in teacher education
Keywords: Educational Policy, Higher Education, Pre-service Teachers, Teacher Professional Development
Presenting Author: Marte Lorentzen, Oslo Metropolitan University, Norway; **Presenting Author:**Hilde Afdal, OsloMet, Norway; **Co-Author:**Hanna Holmeide, Oslo Metropolitan University, Norway

As part of academisation processes, teacher education programmes have developed to become more research-based. A part of this academisation process is that teacher students are required to complete a piece of independent research in the form of a bachelor (BA) or master's (MA) thesis. The thesis is meant to be both "research based" and "profession oriented", where the latter refers to the need for the thesis to be relevant for the students' future professional practice. This paper uses practice architectures as an approach to answer the questions: "What characterizes teacher students' and educators' notions of the final thesis as 'researched based' and 'profession oriented', and how do the practice architectures of the teacher education programs enable and constrain these conceptualizations?". The study was done in two phases. Phase one consisted of a quantitative survey to teacher educators responsible for the BA/MA thesis module. The second phase consisted of qualitative interviews with students, educators, supervisors and head of studies in four selected teacher education programmes. Preliminary results reveal that teacher students' and educators' perceptions of 'research based' and 'profession oriented' vary across the teacher education programs, whereby e.g. early childhood education considered the final thesis to be an inquiry-based project, and actors in the master's programme considered the thesis to be a minor research project that allowed for developing research related skills. In sum, the results will contribute to the existing literature on the ongoing academic orientation of teacher education and their pursuit of 'research based' and 'profession oriented' BA/MA theses

Readiness to Teach Social and Emotional Learning: The Importance of Teacher Education Programs
Keywords: Attitudes and Beliefs, Developmental Processes, Mixed-method Research, Pre-service Teachers
Presenting Author: Shea Ferguson, University of South Carolina, United States; **Co-Author:**Robbie Ross, University of South Carolina, United States; **Co-Author:**Kate Ascetta, University of South Carolina, United States; **Co-Author:**Molly Dawes, University of South Carolina, United States

Increasingly, teachers are responsible for teaching social and emotional learning (SEL) skills to their students, but questions remain about whether teachers are adequately trained to handle this demand during their initial preparation programs. To understand their degree of readiness for this important task, the current study examined preservice teachers' beliefs about SEL, beliefs about the necessity of developmental knowledge (i.e., knowledge about youth's change and growth) for teaching practice, and their perspective on the degree to which their program provided them with that developmental knowledge and specific SEL preparation. Undergraduate students (*N*=158) enrolled in a preservice educator preparation program at a southeastern university in the US completed an online survey, which measured their beliefs about SEL, importance of developmental knowledge for teaching practices, developmental preparation, SEL preparation and three open-ended questions. Analyses revealed that they believe SEL is important, and they plan to use developmental knowledge when making instructional decisions, but only slightly agreed that their program prepared them on developmental knowledge and SEL. The findings from this study demonstrate the importance of teacher preparation programs increasing developmental knowledge preparation and SEL preparation (including specific strategies to use) to effectively prepare students to address SEL in the classroom.

Session H 18

24 August 2023 08:00 - 09:30
UOM_R03
Poster Presentation
Cognitive Science, Developmental Aspects of Instruction, Learning and Special Education, Motivational, Social and Affective Processes

Cognitive Skills and Processes in Early Childhood and Primary Education

Keywords: Achievement, At-risk Students, Attitudes and Beliefs, Cognitive Skills and Processes, Communication Skills, Conceptual Change, Early Childhood Education, Educational Attainment, Foreign and Second Language Acquisition, Learning and Developmental Difficulties, Primary Education, Quantitative Methods, Reading, Science Education, Teacher Professional Development
Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 05 - Learning and Development in Early Childhood, SIG 22 - Neuroscience and Education
Chairperson: Ellen Kok, Utrecht University, Netherlands

The mediating role of children's neurocognition in the relation between physical and academic skills
Keywords: Cognitive Skills and Processes, Educational Attainment, Primary Education, Quantitative Methods
Presenting Author: Anne de Bruijn, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Anna Meijer, Institute of Education and Child Studies, Leiden University, Netherlands; **Co-Author:**Marsh Königs, Emma Neuroscience Group, Emma Children's Hospital, Amsterdam UMC, University of Amsterdam, Netherlands; **Co-Author:**Jaap Oosterlaan, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Joanne Smith, Center for Human Movement Sciences, University Medical Center Groningen, University of Groningen, Netherlands; **Co-Author:**Esther Hartman, University Medical Center Groningen / University of Groningen, Netherlands

Many studies have examined relations among primary school students' physical, neurocognitive and academic skills. Yet, by focusing on specific aspects of these relations, studies have reported inconsistent results. This study aimed to get more insight into these relations by examining all three domains

simultaneously, testing a complete mediational model including measures of physical competencies (cardiovascular fitness and motor skills), neurocognitive skills (lower-order cognitive skills and executive functions), and academic achievement (reading, mathematics, spelling). A large sample of Dutch primary school students (n = 891, 440 boys, mean age 9.17 years, grades 3 and 4) were assessed on the Shuttle Run Test (cardiovascular fitness), items of the Körperkoordinationstest für Kinder and Bruininks-Oseretsky Test-II (motor skills), computerized neurocognitive tests, and standardized academic achievement tests. A multilevel structural equation model was constructed in Mplus to test mediational relations. Results showed that physical competencies were only indirectly related to academic achievement, via specific neurocognitive functions depending on the academic domain involved. Information processing and verbal working memory were important mediators for both reading and spelling, with an additional mediating relation via interference control for the domain of reading. Verbal and visuospatial working memory, and interference control were mediators in the domain of mathematics. Results provide important implications, as children's physical competencies have been declining in recent years. Our results suggest that this might not only have detrimental effects on children's physical development and health, but possibly also on their cognitive development, underlining the importance of increasing children's engagement in physical activity.

Effects of familiarity and complexity on inhibitory control in science learning: preliminary results
Keywords: Cognitive Skills and Processes, Conceptual Change, Primary Education, Science Education
Presenting Author:Élisabeth Bélanger, Université du Québec à Montréal (UQAM), Canada; **Co-Author:**Lorie-Marlène Brault Foisy, Université du Québec à Montréal (UQAM), Canada; **Co-Author:**Steve Masson, Université du Québec à Montréal (UQAM), Canada; **Co-Author:**Patrice Potvin, Université du Québec à Montréal, Canada; **Co-Author:**Emmanuel Ahr, Université du Québec à Montréal (UQAM), Canada; **Co-Author:**François Thibault, Université du Québec à Montréal (UQAM), Canada

Students hold a multitude of intuitive conceptions about natural phenomena that are inconsistent with scientific knowledge and often persist even after science instruction. Past research has highlighted the role of inhibitory control to "resist" intuitive conceptions in scientific reasoning. However, it appears that the activation of inhibitory control could vary depending on the nature of the scientific content to be learned, as well as of the one to be inhibited. We hypothesize that two variables could influence this need for inhibitory control: 1- the *familiarity* of an intuitive conception: the more familiar it is, the more control it might require; 2- the *complexity* of the scientific conception: the more complex, the more demanding it might be to resort to; both situations resulting in a greater need for inhibition. To test these two hypotheses, several pairs of conceptions (intuitive and its scientific counterpart) were submitted to a panel of scientific experts. They were asked to assign them a *familiarity* and *complexity* score to allow an objective selection of the four pairs that best fit the intersection of the two levels (low and high) of both *familiarity* and *complexity*. Using those pairs, four cognitive tasks were created using a negative priming paradigm relying on response time latencies to reveal inhibitory control's magnitude. A hundred 5-6th graders were recruited to complete the tasks. The analyses will allow an identification of the individual and combined effect of *familiarity* and *complexity* on the negative priming effect. First results will be presented at the conference.

Children's School Readiness: Roles of Executive Functioning and Cumulative Family Risks
Keywords: At-risk Students, Cognitive Skills and Processes, Early Childhood Education, Learning and Developmental Difficulties
Presenting Author: Kevin Kien Hoa Chung, The Education University of Hong Kong, Hong Kong; **Co-Author:**Sing Yeung Alfred Lee, The Education University of Hong Kong, Hong Kong; **Co-Author:**Cuina Catrina Liu, The Education University of Hong Kong, Hong Kong; **Co-Author:**Kevin Chan, The Education University of Hong Kong, Hong Kong; **Co-Author:**Chun Bun Lam, The Education University of Hong Kong, Hong Kong

This study investigated the roles of executive functioning (EF) and cumulative family risks in explaining preschool children's school readiness during the COVID-19 pandemic. The cumulative family risks included socioeconomic status (SES), home literacy environment (HLE), children's health risk, and familial risk of dyslexia. Participants were 955 K1 children (M_{age} = 3.53 years, *SD* = 0.41, n_{female} = 46.60%) and their parents from Hong Kong, China. Parents completed a survey package, which measured children's school readiness, EF skills, and family risk factors of SES, HLE, child's health, and familial risk of dyslexia. Hierarchical regression analysis, controlling for children's age and gender, was performed to test the unique contributions of EF and family risks to school readiness. Results showed that in addition to the vital role of EF, the risks of HLE and children's health were negatively associated with school readiness. The interactions between EF and family risks further highlighted the importance of the familial risk of dyslexia in the association between EF and school readiness. Children at higher familial risk of dyslexia suffer from weakened EF skills in support of school readiness. Findings of this study yield practical information indicating the importance of EF and HLE (i.e., access to books, book-reading frequency) on school readiness. These results also shed light on the necessity of developing family literacy and EF interventions to promote home literacy practices and children's EF skills, respectively, especially when traditional schooling is unavailable.

Let's play and talk! An intervention to support vocabulary and narrative development for 3 year olds
Keywords: Cognitive Skills and Processes, Communication Skills, Early Childhood Education, Teacher Professional Development
Presenting Author:MARIA EVANGELOU TSITIRIDOU, International Hellenic University, Greece; **Co-Author:**Gillian Lake, DCU, Ireland; **Co-Author:**Eleni Tympa, International Hellenic University, Greece

Let's play and talk aims to enhance 3-4 years old vocabulary through stories and pretend play sessions. The project addresses children's vocabulary growth, narrative development and preschool teachers' professional development on supporting these. The study is a replication of a successful intervention implemented in England with two variations: i) a professional development component is added, and ii) the intervention is offered by early years teachers instead of a researcher. It is a validation of the original study in a different cultural and linguistic context, in Greece. The components of the intervention are strategically chosen children's stories with enhanced vocabulary and planned pretend-play sessions that derive from the stories. The 10-week implementation will take place in preschools in Thessaloniki. The study's design is a randomised wait-list controlled trial and 120 children, 60 in each group will be recruited. Pre and post-test assessments, before and after the intervention will assess children's outcomes: vocabulary, narrative, pretend play and executive function. The assessment instruments are standardised. Demographic characteristics will be collected, and the Greek validated Home Learning Environment Questionnaire will measure the quality of the HLE. Preschool teachers' understanding of dialogic reading, vocabulary, and narrative development, pretend play, the role of the adult in children's play and executive function, will be explored via focus groups and through professional development sessions. The Teachers' Self-Efficacy Scale will be used. The study will have direct results: the production of a detailed manual, the intervention model, and indirect results: better-trained early years teachers on children's vocabulary development.

The Links between Executive Function, Decoding and Reading Comprehension: English-Arabic Differences
Keywords: Cognitive Skills and Processes, Foreign and Second Language Acquisition, Primary Education, Reading
Presenting Author: Ibtehaj Alrushoud, University of Cambridge, United Kingdom; **Co-Author:**Rui WANG, University of Cambridge, China; **Co-Author:**Michelle Ellefson, University of Cambridge, United Kingdom

Reading comprehension is one of the most important skills in primary education. However, many children struggle to comprehend grade-level texts in their first and additional (could be second) languages despite having adequate decoding (word reading) skills and good additional language proficiency. Recent studies often resort children's poor comprehension in the first language to weak *executive function*. However, little research has investigated this association in children speaking more than one language. In this small-scale study, we recruited 9-to -10-year-old (*N* = 8, *Mage* = 9.99 years, *SD age*= 0.40 years) learners of English as an additional language. They completed a set of tasks including executive function (indexed by measures of *working memory*, *inhibition* and *cognitive flexibility*), reading comprehension and decoding of non-words (meaningless words) in Arabic and in English. Results using Spearman's correlation matrix indicated a positive correlation between inhibition and Arabic nonword decoding. Further, the results suggested a significant positive association between children's ability to decode nonwords in both languages as well as a strong link between their ability to comprehend English texts and to decode English nonwords. The findings highlight the importance of executive function in supporting the formation of a broader reading comprehension model and suggests the need to consider the role of executive function in supporting additional language learners with reading comprehension difficulties. Practically, it could support the inclusion of executive function measures alongside decoding and linguistic skills in reading comprehension test batteries to identify and support children at-risk with reading comprehension.

Effect of Stereotype Threat on the Performance of Elementary School Children: A Meta-Analysis
Keywords: Achievement, Attitudes and Beliefs, Cognitive Skills and Processes, Primary Education
Presenting Author: Fanny MAGOUTIER, University Grenoble Alpes, France; **Co-Author:**Pascal Pansu, Université Grenoble Alpes, France; **Co-Author:**Boris Vallée, université Rouen Normandie, France

Research on stereotype threat shows that students who are not socially stigmatized outperform those who are stigmatized at school. Here, we examine when and why stereotypes can become threatening at school. We conducted a meta-analysis to measure the extent of stereotype threat effect on academic performance among elementary school children. After identifying articles written between February 2022 and 1995 (date when the first studies were carried out by Steele and Aronson), we found 17 relevant studies, with 25 independent effect sizes, including gender, ethnic origin, obesity and low socio-economic status stereotype threats. Among the moderators tested, three were significant: “Grade” (kindergarten-1st grade versus 2nd to 5th grade), “Stereotype type” (gender versus other), and “Domain” (intelligence versus math and language arts). The results showed that younger children were less sensitive to stereotype threat than 2nd to 5th graders. Contrary to our expectations, the effect of gender stereotype was not as strong as that of the other stereotypes aggregated (obesity, plus low SES and ethnic minorities). We also observed that the effect of the lower intelligence stereotype was stronger than that of lower math and language arts ability. Thereafter, we ran an analysis including all moderators, controlling the effect of each moderator by the others. The results confirm again that school age (Grade) appears to be a key determinant of the occurrence of stereotype threat. However, additional analyses cannot rule out publication bias. Consequently, it is important to conduct more studies with this population to consolidate the results obtained.

Session H 19

24 August 2023 08:00 - 09:30
UOM_R01
Poster Presentation
Learning and Social Interaction, Teaching and Teacher Education

Social Interaction and Learning

Keywords: Achievement, Classroom Management, Communication Skills, Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Creativity/Divergent Thinking, Developmental Processes, Dialogic Pedagogy, Higher Education, Knowledge Construction, Peer Interaction, Primary Education, Secondary Education, Social Aspects of Learning and Teaching, Social Interaction, Teaching/Instructional Strategies, Video-based Learning, Well-being
Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Julian Fick, TU Braunschweig, Germany

Teachers‘ productive error management behavior as integral part of whole class interaction
Keywords: Achievement, Classroom Management, Dialogic Pedagogy, Social Interaction
Presenting Author: Martin Majcík, Masaryk University, Czech Republic

The goal of this proposal is to identify ways of teachers’ productive error management behavior which is associated with teachers’ support to pupils during the error situation. That productive approach could be concretized through a type of teacher’s feedback. This way of handling pupils’ errors is related to affective and cognitive dimensions of error management behavior. Qualitative research was conducted in Czech language and literature of lessons of the 9th lower secondary class. The observation of 24 lessons was supplemented by interviews with teachers and pupils. The data were analyzed by open coding and conversational analysis. Linguistic ethnography was chosen as an interpretative framework because of the different sources of data. The results present the productive ways how teachers handle errors during whole class interaction. Different approaches were identified in situations with discussion and during a task with repeating the curriculum. In the case of the discussion, teachers tend to use errors as opportunities to active pupils’ participation. On the other hand, during repeating task, they support pupils in the process of repair errors by using hints and questions.

A Theoretical Conceptualization of the Quality of Pedagogical Interactions. A 2*3*2 Systematic
Keywords: Classroom Management, Social Aspects of Learning and Teaching, Social Interaction, Well-being
Presenting Author: Boris Eckstein, University of Teacher Education Zurich, Switzerland; **Co-Author:**Alexander Wettstein, PHBern / University of Bern, Switzerland

This theoretical contribution proposes a 2*3*2 systematic for conceptualizing the quality of pedagogical interactions. The systematic builds upon social-cognitive constructivism, interactionism, and perceptual psychology. We further rely on three crucial concepts: 1. The supply-use model of teaching quality, 2. the three basic dimensions of teaching quality, and 3. the behavioral and the perceptual element of pedagogical interactions. The proposed 2*3*2 systematic differentiates between manifest behavior and individual perceptions, considers the different roles of teachers and students, and conceptualizes teaching as a genuinely interactional process. These ideas might fertilize methodological considerations for future studies to achieve precise analyses of the quality of pedagogical interactions.

Instructors body postures and their influence on perceived teacher enthusiasm and students’ interest
Keywords: Communication Skills, Social Interaction, Teaching/Instructional Strategies, Video-based Learning
Presenting Author:Sören Traulsen, Leibniz Universität Hannover, Germany; **Co-Author:**Lysann Zander, Leibniz Universität Hannover, Germany

Body postures can affect how people perceive themselves; postures of others can affect how they are perceived. Research on body postures has been critically discussed in the scientific community. Overall, findings are mixed but there is relatively strong evidence for posture effects on self-perceptions. In this preregistered study, we investigated how a teacher's posture in a video tutorial affects students’ perceptions of the teacher’s enthusiasm and their situational interest in the tutorial topic. Additionally, we measured teacher’s perceived agency and communion for exploratory data analyses. Differentiation of the body posture was carried out by systematically varying the dimensions of verticality (Upright/Slumped) and horizontality (Open/Closed). We hypothesized that perceived teacher enthusiasm and situational interest would be rated higher when students watched a tutorial with the teacher's posture upright versus slumped. Furthermore, we expected higher ratings for these variables when students watched the tutorial with the teacher's body posture open versus closed. Students (N=195) from different classes of a German University were randomly assigned to one of these tutorials and were asked to answer a subsequent survey. Group comparisons showed that the teacher's upright posture compared to a slumped posture had a positive effect on perceived teacher’s enthusiasm; no effects on students' interest were found. Additionally, posture openness was relevant to perceptions of communal traits while an upright posture paired with an open posture influenced perceptions of agency. We discuss the implications of these results for teachers in digital and in class-teaching and possible boundary conditions.

Beyond the Classroom Walls: De-encapsulation in a Change Laboratory Intervention with Adolescents
Keywords: Cooperative/Collaborative Learning, Secondary Education, Social Aspects of Learning and Teaching, Social Interaction
Presenting Author: Pauliina Rantavuori, Tampere University, Finland; **Presenting Author:**Piia Ruutu, University of Helsinki, Finland; **Co-Author:**Yrjö Engeström, University of Helsinki, Finland; **Co-Author:**Maria Tapola-Haapala, University of Helsinki, Finland

In an encapsulated classroom, the school text (the knowledge conveyed by teachers and textbooks and reproduced in tests and exams) tends to become the object of the activity instead of being an instrument for understanding the world. The encapsulation of school learning is becoming increasingly dysfunctional due to two major societal transformations. These are the digital world's spread and pervasive influence that captures students' attention and the societal turmoil ranging from racism to the global climate crisis and calls for an entirely new depth and breadth of both conceptual understanding and activist involvement. In order to make sustainable progress in de-encapsulation, we need to identify, document, analyse, and foster a wide variety of actions and practices. In this study, 8th graders from two comprehensive schools in Finland worked on projects chosen and shaped by themselves, with the support of researchers during the

school year. The projects were carried out in Change Laboratory interventions. We examined adolescent students' initiated and enacted steps of breaking out of the encapsulated classroom and school. The de-encapsulation actions of the 11 student groups were analysed along three dimensions by paying attention to the individual or collective nature of the de-encapsulation efforts, the direction of the movement, as well as the composition of the movement (physical vs. imaginative and discursive movement). The findings show that we should seriously notice and nourish students' own attempts at de-encapsulation.

Dialogues across time and space in a video-based collaborative learning environment
Keywords: Computer-supported Collaborative Learning, Higher Education, Social Interaction, Video-based Learning
Presenting Author: Charlotte Beal, University of South-Eastern Norway, Norway; **Co-Author:**Rolf Steier, OsloMet, Norway

In this paper, we investigate how student teachers' group dialogues emerge and intersect across time and space as the students collaboratively constructed a video-based mind map to prepare for oral exams in pedagogy. Over two sessions during a one-week project, 22 4th year student teachers forming 5 groups were video recorded and analysed. The dialogues studied include both synchronous and asynchronous discussions among group members as they viewed, recorded, and uploaded videos. Findings from our interaction analysis offer in-depth understanding of how collaboration occurs in different space-time configurations within and across groups. The analysis shows how time and space shape learners' interactions and onward epistemic orientations in the computer-supported collaborative learning (CSCL) setting. Here, participants coordinate their actions towards prior conversations and extend present reality as they traverse the immediate conversational setting and become part of a network of emerging dialogues in the larger student community – intertwined in and enabled by their use of a digital platform.

Learning, thinking and co-creating as embodied dialogue – a dialogic-inclusional approach
Keywords: Creativity/Divergent Thinking, Dialogic Pedagogy, Knowledge Construction, Social Interaction
Presenting Author: Eva Vass, Western Sydney University, Australia

In our attempts to reimagine education we need to return to the body and cultivate our receptiveness towards an embodied aesthetics of understanding. This has never been more pressing than in our post-pandemic path-seeking. Responding to this urgency, this theoretical paper draws on the vision of the self as deeply rooted in embodied experience and sees mutually receptive-responsive dialogue as foundational in collaborative learning, thinking and creativity. The paper draws on extensive research on collaborative learning and co-creativity in various educational contexts (primary schools, university settings and informal learning environments). In particular, it revisits the core themes arising from my most recent body of work on the Kokas music pedagogy and presents the theorisations that have evolved in synergy with my engagement with research data. It discusses the inclusional-dialogic approach developed through this research, marrying Bakhtinian dialogism and the ecological wisdom of Natural Inclusionality (Rayner, 2022; 2017). It is argued that, through the broadening of legitimised modes of educational and scientific inquiry, we can re-imagine learning and teaching (and therefore theorising and research on these) as embodied, co-creative, receptive-responsive dialogue towards discernment and creative knowledge. Through these considerations, the paper aims to re-ignite educational interest in experience-centered pedagogies, and problematise the ways in which the pervasive dominance of online education in the past few years has distanced – and oftentimes fully removed – us from crucial, nurturing opportunities to learn, teach or co-create through collective, lived experiences of being and becoming.

Are peer interaction during school recess and motor performance related in 6- to 8-year olds?
Keywords: Developmental Processes, Peer Interaction, Primary Education, Social Interaction
Presenting Author: Dagmar Derikx, University Medical Center Groningen / University of Groningen, Netherlands; **Co-Author:**Marina Schoemaker, University Medical Center Groningen / University of Groningen, Netherlands; **Co-Author:**Suzanne Houwen, University of Groningen, Netherlands; **Co-Author:**Esther Hartman, University Medical Center Groningen / University of Groningen, Netherlands

Motor development during childhood is predictive for success later in life, but motor skill levels have decreased significantly over the past decades. Therefore, it is important to identify potentially modifiable risk- or enabling factors. Through interactions with other people, children may improve their motor skills by observing and imitating the motor skills of others and by practicing their own motor skills. School is an influential place, as children spend many hours there. Recess is the main setting for children to interact relatively freely with peers, which provides opportunities to practice motor skills. Therefore, the aim of this study is to examine the relationship between the amount and type of interaction with peers during recess and the motor performance of 6- to 8-year-old typically developing children. Motor performance is measured with the Movement Assessment Battery for Children-2. Interaction with peers during recess is observed using an adapted version of the System for Observing Children's Activity and Relationships During Play during which the physical activity level, group size, group composition, activity type, and interaction type are notated. The sample presently consists of 72 children (mean age 89.0 ± 5.6 months, 55.6% boys), but data collection is still in progress (required $n = 95$). As far as we know, we are the first to investigate this relationship in 6- to 8-year-old typically developing children. Knowledge regarding this relationship will give teachers and policy makers the opportunity to create the most optimal situations during recesses in which motor performance can be practiced and improved.

Session H 20

24 August 2023 08:00 - 09:30
UOM_R02
Poster Presentation
Teaching and Teacher Education

In-service Teachers' Professional Development

Keywords: Cognitive Skills and Processes, Communities of Learners and/or Practice, Competencies, Educational Policy, Educational Technologies, Eye Tracking, Higher Education, In-service Teachers, Mentoring and Coaching, Mixed-method Research, Self-efficacy, Self-regulated Learning and Behaviour, Teacher Professional Development, Teaching Approaches
Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Johan Korhonen, Åbo Akademi University, Finland

Predicting Teacher Attrition at Disadvantaged Schools – Impact of a Mentoring Intervention
Keywords: Educational Policy, In-service Teachers, Mentoring and Coaching, Teacher Professional Development
Presenting Author: Marcus Kindlinger, University of Duisburg-Essen, Germany; **Co-Author:**Eva Anderson-Park, University of Duisburg-Essen, Germany; **Co-Author:**Hermann J. Abs, University of Duisburg-Essen, Germany

One common problem education systems face is high attrition among novice teachers. This problem is even more prevalent at schools in disadvantaged areas where teachers are often confronted with a combination of different challenges such as limited resources, , higher proportion of students who display challenging behaviours, and students who lack basic skills and abilities (Martínez, 2014; Tannehill & MacPhail, 2017).Adaptive mentoring has been proposed as a possible method to support beginning teachers in the first years in their new jobs. In our study, we evaluated an EU-funded international policy experiment on adaptive mentoring for novice teachers in the context of disadvantaged schools. Using a quasi-experimental design, we analyse questionnaire data from novice teachers in control and treatment groups. We focus on novice teachers' self-reported intention to leave the teaching profession either in the short or long term. Preliminary results indicate that the mentoring programme did not have an effect on novice teachers' intention to quit. Our data further indicates that novice teachers' intention to quit is strongly related to personal preconditions such as their age and job motives, structural conditions such as perceived satisfaction with the workplace. While those factors may be hard to influence through mentoring, the data also showed that teacher resilience leads to a decrease in intentions to quit. Future mentoring programmes may benefit from focusing on fostering resilience and self-regulation of beginning teachers.

Teachers' Self-Regulated Learning behaviors as a predictor of self-regulated learning teaching

Keywords: In-service Teachers, Mixed-method Research, Self-regulated Learning and Behaviour, Teacher Professional Development
Presenting Author: Tova Michalsky, Bar-Ilan University, Israel

In this study, the predictive value of three aspects of teacher self-regulated learning (SRL) as learners regarding teachers' promotion (SRL) in their actual teaching is modelled by means of structural equation modelling. These include teacher SRL skills as learners (1) planning, (2) monitoring, and (3) evaluation. 421 mathematics high school teachers participated in the study. Path analysis revealed that teachers' monitoring skills, along with their evaluation skills as learners, were predicting teachers' promotion of SRL in their teaching positively. The results offer new insights into teacher SRL skills and how they account for teacher practice regarding the promotion of SRL in their students. This study is particularly innovative as it is the first study in the field of teachers and SRL to investigate teacher SRL skills as learners (online measure) and teacher promotion of SRL in their classroom. These results can serve to construct a model of teachers' promotion of SRL, as well as provide ideas on how to help teachers supporting SRL in their teaching.

School-based Professional Learning Communities in a centralized educational system
Keywords: Communities of Learners and/or Practice, Educational Policy, In-service Teachers, Teacher Professional Development
Presenting Author: Christina Stavrou, Cyprus Pedagogical Institute, Cyprus; **Co-Author:**Efi Paparistodemou, Cyprus Pedagogical Institute, Cyprus; **Co-Author:**Pavlina Hadjitheodoulou-Loizidou, Cyprus Pedagogical Institute, Cyprus

Teachers' Professional Learning approaches, in the centralised public educational system of Cyprus, are taking steps towards the creation of school-based Professional Learning Communities (PLCs) as a more effective and participatory model. This study aims to investigate the characteristics within PLCs and elements that Cyprus teachers take into consideration for implementing practices and actions. Data was collected via questionnaires and interviews with teachers, as part of a funded project. Findings showed that trust, open communication, feeling of reinforcement in the group are some valuable characteristics of PLCs. Empowering teachers as leaders and coordinators and creating time slots dedicated to discussion, interaction and reflection emerged, to see how in the context and characteristics of a centralised educational system can contribute to a PLC culture. Policy implications regard the support of PLCs towards more autonomous and effective ways for teachers' professional learning.

Measuring Content- and Technology-Related Knowledge of Teachers – Self-Reports vs. an Knowledge Test
Keywords: Competencies, Educational Technologies, Self-efficacy, Teacher Professional Development
Presenting Author: Timo Kosiol, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Stefan Ufer, Ludwig-Maximilians-Universität (LMU), Germany

Self-Reports are often used to measure professional knowledge as described in the TPaCK framework, because objective test instruments for the technology-related facets of the framework are not available. It remains uncertain if the reported self-efficacy measured by these self-reports provides a valid assessment of individual knowledge. Furthermore, self-reports fail to consistently replicate the theoretical structure of the TPaCK framework. N=207 teachers and N=185 teacher students at secondary level answered the test instrument of the content- and technology-related facets of the TPaCK framework (CK, PCK, TCK, and TPCK). N=78 of the teachers and N=99 of the teacher students also provided self-reports on these facets of professional knowledge. The answers of the test instrument were analyzed using a Rasch model. The reliabilities of the different facets were acceptable to good for both measures. The theoretical structure could be confirmed empirically for both self-reports and the knowledge test instrument. Correlations indicate that self-reports, especially for PCK and TPCK, do not validly represent individual knowledge as measured by the test instrument.

Comparing Frameworks for Professional Standards and Competencies for Teacher Education Worldwide
Keywords: Educational Policy, Higher Education, Teacher Professional Development, Teaching Approaches
Presenting Author: Susanne Narciss, TU Dresden, Germany; **Co-Author:**Jörg Zumbach, University of Salzburg, Austria

Ever since the World Education Forum in Dakar in 2000, the development of teaching standards has been an important topic on the global education agenda. The aim has been to improve the quality of education to equip learners with the competencies for effective participation in today's societies and economies. Hence, professional standards of teaching, as well as teaching competency frameworks, have been developed worldwide in order to specify the necessary knowledge, skills, strategies, values, and attitudes, as well as teaching activities that contribute to successful professional behaviors in the field of learning and instruction. These standards provide the basis for teacher education and for promoting teachers' continued professional development (Centre of Study for Policies and Practices [CEPPE], 2013). Furthermore, they provide a yardstick that enables teachers to track their professional conduct concerning the various competency domains of teaching (e.g., instructional design, classroom organization and management, and learning assessment and feedback). This paper presents a review and comparison of selected teacher standards and competency frameworks from different regions of the world, including Australia, Europe, Southeast Asia, the United States, and Africa. Furthermore, it will discuss the implications raised by the commonalities and differences among these frameworks.

Teachers' shift of attention in authentic teaching situation
Keywords: Cognitive Skills and Processes, Eye Tracking, Mixed-method Research, Teacher Professional Development
Presenting Author: Maikki Pouta, University of Turku, Finland; **Co-Author:**Erno Lehtinen, University of Turku, Finland; **Co-Author:**Tuire Palonen, University of Turku, Finland

The aim of this study was to explore differences in student teachers' and experiencedteachers' shift of attention during authentic mathematics lesson and its relation to their judgements of pupils. To guide pupils optimally, teachers need professional vision skills and accurate judgements of individual pupils need for help. Professional vision is known to be a situated process. Identifying pupils' individual needs demands accurate judgements skills, which relation to professional vision has only recently been investigated. One mathematics lesson from student teachers (n=4) and experienced teachers (n=4) was recorded with Tobii Pro Glasses 2 mobile eye-tracking device. Before the lesson, each participant evaluated their pupils' mathematical competencies with judgements survey. Teachers' shifts of attention was studied with times of interest analysis of the eye movements and its relation to teacher's judgements with correlation analysis. The results show that the correlations of student teachers' and experienced teachers' judgements in different areas of mathematics varied between particular student teacher – experienced teacher pairs teaching the same group of pupils. Interestingly, student teachers and experienced teachers were similar in their shifts of attending, despite more individual differences among student teachers. Both experienced teachers and student teachers were mostly attending to the pupils they were guiding. Results indicate that both student teachers' and experienced teachers' shift of attention is situation-specific rather than fixed by their knowledge of a pupil's need for support in mathematics.

Session H 21

24 August 2023 08:00 - 09:30
UOM_R04
Poster Presentation
Instructional Design, Learning and Instructional Technology

Learning and Instructional Technologies

Keywords: Classroom Assessment, Computer-assisted Learning, E-learning/ Online Learning, Educational Technologies, Engagement, Feedback, Higher Education, Instructional Design, Learning Strategies, Metacognition, Problem Solving, Secondary Education, Social Interaction, Teacher Professional Development, Tool Development
Interest group: SIG 01 - Assessment and Evaluation, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Bernadette Dilger, University of St.Gallen, Switzerland

Extending Design Thinking with Digital Technologies
Keywords: Classroom Assessment, Educational Technologies, Secondary Education, Teacher Professional Development

Presenting Author: Manolis Mavrikis, UCL Knowledge Lab, United Kingdom; **Co-Author:**Marcelo Milrad, Linnaeus University, Sweden; **Co-Author:**Chronis Knyigos, National and Kapodistrian University of Athens, Greece; **Co-Author:**Marianthi Grizioti, National and Kapodistrian University of Athens, Greece; **Co-Author:**Christothea Herodotou, Open University, United Kingdom; **Co-Author:**Lieva Van Langenhove, Ghent University, Belgium; **Co-Author:**Katrien Strubbe, Ghent University, Belgium; **Co-Author:**Sofia Papavlasopoulou, Norwegian University of Science and Technology (NTNU), Norway; **Co-Author:**Carina Girvan, Trinity College Dublin, Ireland; **Co-Author:**Filothei Chalvatza, SIMPLE, Greece

The use of emerging technologies (ET), such as Artificial Intelligence (AI), Augmented Reality (AR), 3D printing and Virtual Robotics (VR) are amongst the EU targeted actions for supporting the digital transformation of education (Digital Education Action Plan, 2021-2027). Yet, despite these technologies being accessible to education stakeholders, there is a lack of concrete pedagogy and teachers' professional development for their meaningful infusion into the current educational context. Extending Design Thinking with Emerging Digital Technologies (Exten (D.T.)2) is a [name of funder removed] project aiming to use: AI, AR, VR and 3D printing technologies, to enhance the pedagogical value, sustainable digitization and potential for wide deployment of Design Thinking (DT). DT (Brown, 2008) is a promising pedagogical innovation, based on interdisciplinary co-creation, that can lead to sustainable and feasible product solutions, which has yet to be tested widely in education. Through Design-Based Research (DBR) and a co-production approach with teachers, Exten (D.T.)2 will use emerging technologies and design thinking to design, pilot and scale up a sustainable learning implementation that can foster students' 21st century skills.

Socially Withdrawn Students' Engagement in Classroom Discussions Under Three Learning Modalities

Keywords: E-learning/ Online Learning, Educational Technologies, Engagement, Social Interaction

Presenting Author: Yue Sheng, The Ohio State University, United States; **Co-Author:**Monica Lu, The Ohio State University, United States; **Co-Author:**Ziye Wen, The Ohio State University, United States; **Co-Author:**Eric Anderman, The Ohio State University, United States; **Co-Author:**Tzu-Jung Lin, The Ohio State University, United States; **Co-Author:**Michael Glassman, The Ohio State University, United States; **Co-Author:**Saetbyul Kim, The Ohio State University, United States

Classroom dialogic interaction has the potential to promote students' social, psychological, and cognitive development. However, socially withdrawn students often show limited participation in discussions due to social anxiety. With the advancement of classroom technology, dialogic interaction can be extended beyond face-to-face to online environments. This study examined how social withdrawal relates to 4^{th} and 5^{th} graders' learning engagement under three modalities: face-to-face small group discussions, asynchronous text-based discussion boards, and an asynchronous video-based discussion forum (e.g., Flipgrid). Results from regression analysis indicated that when students engaged in face-to-face small group discussions, there was no significant relation between social withdrawal and engagement. This finding calls for the need to create an inclusive learning environment for socially withdrawn students to voice their opinions. In contrast, we found that socially withdrawn students are less engaged than their peers while using Flipgrid. Results suggested that educators should consider providing students with diverse learning opportunities to keep all students engaged.

Tools to create adaptive learning technologies without programming

Keywords: Computer-assisted Learning, Educational Technologies, Instructional Design, Tool Development

Presenting Author: Vincent Aleven, Carnegie Mellon University, United States; **Co-Author:**Jonathan Sewall, Carnegie Mellon University, United States

Intelligent tutoring systems (ITSs), an essential form of adaptive learning technologies, have been shown to be very effective in helping students learn a range of subject matter. These systems support learning-by-doing of complex problem-solving skills with a variety of adaptive instructional features, including repeated practice on well-tailored tasks in varied contexts with explanatory feedback and as-needed instruction.
Given the proven effectiveness of ITSs, a key question is: How can we facilitate their development? Over a period of 20 years, we have developed the Cognitive Tutor Authoring Tools (CTAT), which introduce a new paradigm for ITSs called example tracing tutors. These tools permit users to create adaptive tutors without writing program code, hence enabling educational researchers, instructional designers, instructors, and teachers to author their own ITSs. Key authoring tasks made easy by CTAT are (1) creating a tutor interface through drag-and-drop methods, (2) representing problem-solving knowledge in a problem-specific behavior graph through programming by demonstration, and (3) embedding tutors in a standard learning management system. A new feature is that CTAT is now web-based, which streamlines authoring, makes it easier to get started, and hopefully will attract more authors.
To illustrate the efficacy and utility of these tools, we discuss how many people have used CTAT for real projects: many tutors built with CTAT have been shown to help students learn in real educational settings. Authoring tools such as CTAT may contribute to the widespread development and adoption of ITSs.

Written- or video-feedback? A study of the students' feedback use, perceptions and performance

Keywords: Educational Technologies, Feedback, Higher Education, Instructional Design

Presenting Author: Ignacio Máñez, University of Valencia / Interdisciplinary Research Structure for Reading Research (ERI Lectura), Spain; **Co-Author:**Noemi Skrobiszewska, University of Valencia / Interdisciplinary Research Structure for Reading Research (ERI Lectura), Spain; **Co-Author:**Adela Descals, University of Valencia, Spain; **Co-Author:**María José Cantero, University of Valencia, Spain; **Co-Author:**Rafael García, University of Valencia, Spain; **Co-Author:**Raquel Cerdan, University of Valencia, Spain; **Co-Author:**Óscar Fernando García, University of Valencia, Spain

Students often ignore the feedback messages they receive through digital learning environments, probably due to the presentation format employed. Although university students tend to prefer the video format, professors usually employ the written format to deliver feedback on their assignments. The present study aims to analyze the extent to which the feedback presentation format (Video-feedback vs Written-feedback) influences the students' decision to access Elaborated Feedback (EF) messages digitally delivered for the academic assignments, their exam performance, and their feedback perceptions (satisfaction with EF and its perceived usefulness). One hundred seventy-one freshmen students enrolled in the degree in Teacher Training for Early Childhood/Primary Education participated in the study. Seventy-eight students received EF on the assignments in written format and ninety-three in video format. Feedback messages were provided through the digital platform the day after the assignment deadline and no additional feedback was provided in the classroom. Finally, students took the course exam. The results suggest that the feedback presentation format influences the students' decision to access EF messages, indicating that students in the Written-feedback group accessed more EF messages than their Video-feedback counterparts. However, the presentation format did not influence performance outcomes and feedback perceptions. Practical implications on how to deliver formative feedback through digital environments will be discussed.

The authentic use of interleaving: How can students be supported to mix categories?

Keywords: Educational Technologies, Instructional Design, Learning Strategies, Metacognition

Presenting Author: Erdem Onan, Maastricht University, Netherlands; **Co-Author:**Felicitas Biwer, Maastricht University, Netherlands; **Co-Author:**Roman Abel, Ruhr University Bochum, Germany; **Co-Author:**Wisnu Wiradhany, Binus University, Indonesia; **Co-Author:**Anique de Bruin, Maastricht University, Netherlands

Effective learning strategies are desirably difficult for students. These strategies are more effortful and may impair immediate performance but enhance long-term learning. Interleaved practice (mixing examples of to-be learned categories) is one desirably difficult strategy for students. Helping students to adopt interleaved practice, however, is a major challenge. Past research showed that over 40% of students refrain from interleaved practice despite strategy interventions. Furthermore, it remains unclear whether students would apply interleaved practice when they need to create their own study order, by making item-based decisions. Therefore, in this study, we will test the efficacy of a novel intervention that aims to promote the use of interleaved practice in educationally more authentic scenarios. This intervention will confront two main reasons that seem to undermine students' adoption of interleaved practice: Erroneous beliefs about the efficacy of interleaved practice and inaccurate monitoring of effort and learning during strategy implementation. Furthermore, the intervention will provide students with a metacognitive tool that would help students to verify the instructions with their own experiences. In a pre-test/post-test design, strategy intervention will be manipulated between subjects. All students will learn visual categories, but unlike prior research, they will not only indicate the strategy they want to use but will also create their own study order. The findings of this study will inform the development of an online strategy module that can stand alone or be combined with existing strategy trainings.

Teacher Students Discourses of Programming Activities in Teacher Education

Keywords: Educational Technologies, Instructional Design, Problem Solving, Teacher Professional Development

Presenting Author: Jeanette Sjöberg, Halmstad university, Sweden; **Co-Author:**Emma Edstrand, Halmstad University, Sweden

In recent years, programming as a subject have increasingly become an important part of primary school curriculum in many countries. As a consequence, programming activities have also been merged into teacher training programs in higher education as part of content knowledge for future school teachers. In this paper we investigate how groups of teacher students in their discussions constructs ideas about programming while performing different programming tasks within their teacher training education. The study is drawn from online workshops where the teacher students are engaged in programming activities working in groups. The research questions we ask in this paper are: 1). In what ways do teacher students concretise their comprehension of creating didactical conditions for teaching programming as a subject in primary school? and 2). How are different discourses about the learning process and didactical potential in relation to programming activities constructed in teacher students' discussions while involved in programming activities in teacher education? Using a discourse analytical approach, the results of the study show conflicting contradictions among the teacher students' opinions of programming as a teaching subject within primary school.

Session H 22

24 August 2023 08:00 - 09:30
UOM_GYM
Roundtable
Cognitive Science, Motivational, Social and Affective Processes

Vocational Education and Apprenticeship Training

Keywords: Comprehension of Text and Graphics, Digital Literacy and Learning, Emotion and Affect, Metacognition, Quantitative Methods, Social Development, Vocational Education and Apprenticeship Training
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 14 - Learning and Professional Development
Chairperson: Taiga Brahm, University of Tübingen, Germany

Identification in Vocational Education and Training: effects of training quality and satisfaction
Keywords: Emotion and Affect, Quantitative Methods, Social Development, Vocational Education and Apprenticeship Training
Presenting Author: Eveline Wuttke, Goethe-Universität Frankfurt, Germany; **Co-Author:**Karin Heinrichs, Pädagogische Hochschule Oberösterreich, Austria; **Co-Author:**Kristina Kögler, University of Stuttgart, Germany

The development of identification with a company and/or an occupation is, besides the acquisition of vocational competence, a central target of vocational education and training (author 2020; authors 2022). Identification with an occupation and/or a company is important from the point of view of employees and employers because it goes along with occupational satisfaction, has a system-stabilising effect, and is intertwined with occupational competence development (Baethge et al., 2006). However, there is a lack of findings on the characteristics, conditions, and effects of social identification within the framework of vocational education and training. In our study we address this gap and analyse what leads to identification with a company and/or an occupation and how this is related to job satisfaction.

Adolescents' mind wandering during reading on paper and screen
Keywords: Comprehension of Text and Graphics, Digital Literacy and Learning, Metacognition, Vocational Education and Apprenticeship Training
Presenting Author: Viktoria Foss, University of Stavanger, Norway

Teachers are increasingly adopting digital textbooks into their teaching, adding to the hours that students are already spending on their digital devices at school and in their spare time (EU Kids Online, 2020; Bakken, 2021). However, recent meta-studies have found consistent print advantages in reading comprehension and metacognitive calibration when comparing screen and print reading conditions (Delgado et al, 2018; Clinton, 2019). Less research has looked at the direct effect of the digital medium on attention during the reading process along with the individual characteristics of the reader that interplay with these conditions. Using a within-subjects design with existing class samples, the present study will test Norwegian vocational students (n=100-200) with informational texts in both print and screen reading conditions on the following measures: reading comprehension (RC), mind wandering through the proportion of task-unrelated thoughts (TUT) and accuracy of metacognitive calibration through judgment/prediction of performance (JOP/POP). We will also investigate individual participant features, such as media use habits and preferences; and traits of cognitive control, such as sustained attention capacity, working memory and inhibition. Importantly, the study will be conducted in a classroom with ecologically valid materials, including participants' own laptop computers and authentic school texts in both media. Consistent with previous research, we expect that participants reading on screen will demonstrate less on-task attention, less accurate calibration and reading comprehension than those reading the printed texts, and that the difference in reading comprehension can be explained by the other variables.

Session H 23

24 August 2023 08:00 - 09:30
UOM_A04
Workshop
Teaching and Teacher Education

VOICE workshop: Supporting Early Childhood Education Teachers to enhance children's participation

Keywords: Early Childhood Education, In-service Teachers, Synergies between Learning / Teaching and Research, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education

The aim of this workshop is to provide teacher educators and researchers with a methodology for supporting early childhood education (ECE) teachers in enhancing children's participation in decision making about and during the educational process. The necessity for enhancing children's participation stems both from children's right for their voices to be listened to as well as from constructivist theories of learning that emphasise children's active participation as a precondition for learning. The necessity for supporting teachers in providing opportunities for children's participation stems from research evidence showing that ECE teachers' beliefs of children as lacking abilities (deficit model) often act as obstacles for enhancing participatory ECE practices. Research based on observations of teachers' practices also shows in some cases children's limited opportunities for participation in decision making in ECE settings. The workshop is organised with the use of evidence-based and applied educational material and tools produced within an educational programme (VOICE). It is based on several interactive activities that assist teacher educators and researchers to provide opportunities for ECE teachers to reflect, question and rethink their beliefs and practices, familiarise with the preconditions and possibilities for children's participation as well as with relevant research and reflective tools for achieving a critical awareness of their practice.

VOICE workshop: Supporting Early Childhood Education Teachers to enhance children's participation
Presenting Author:SOFIA AVGITIDOU, Aristotle University of Thessaloniki, Greece; **Co-Author:**Vassiliki Alexiou, University of Western Macedonia, Greece; **Co-Author:**SONIA LYKOMITROU, University of Western Macedonia, Greece

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Session H 24

24 August 2023 08:00 - 09:30
UOM_A06
ICT Demonstration
Motivational, Social and Affective Processes

Appwel, measuring and increasing the school well-being of pupils

Keywords: Bullying, Emotion and Affect, Secondary Education, Well-being
Interest group: SIG 08 - Motivation and Emotion

Please bring your own device if you are attending this ICT demonstration.Wellbeing and involvement are two important conditions for learning (Laevers, 2015). Like wise, school success and ambition lead to a higher wellbeing (Hargreaves & Shirley, 2018). As such, attention for wellbeing and learning performance should coincide, strengthening each other mutually. Setting the bar high for everyone both in terms of school success and in terms of wellbeing should be goals that every school strives for.In the present study, we focus on the school's context and talk about school wellbeing as a multidimensional, holistic concept that impacts all parts of life (Hird, 2003). We work with five subconstructs: satisfaction, engagement, academic self-concept, social relations and pedagogical climate.Recently there has also been an increased focus from social and policy perspective on the wellbeing of pupils and students at school. In the context of education there was a lack of dynamic monitoring instruments that are ready to use for practice in schools. Hence, there is an urgent need of schools for an instrument to measure school wellbeing and support schools in their endeavour to achieve high levels of wellbeing for every student. The goal of the Appwel-project became clear and relevant. Currently, 162 schools with a total of around 40 000 students work with Appwel today. In the ICT demonstration, we explore the possibilities of Appwel. We briefly discuss the creation of the tool and its relevance to the field.. At the end of the workshop, time will be made to give feedback and share experiences.

Appwel, measuring and increasing the school well-being of pupils
Presenting Author: Hanne Luts, PXL University of Applied Sciences and Arts/UHasselt, Belgium; **Co-Author:**Lies Hamal, PXL University College, Belgium

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Session H 25

24 August 2023 08:00 - 09:30
UOM_A10
ICT Demonstration
Teaching and Teacher Education

Human-based simulation in a virtual space: "walk the talk" of training educators in an uncertain era

Keywords: Conceptual Change, Peer Interaction, Simulation-based Learning, Teaching/Instructional Strategies
Interest group: SIG 11 - Teaching and Teacher Education

Please bring your own device if you are attending this ICT demonstration.Simulation-based learning (SBL), which simulates the professional arena for learning and practice purposes, is increasingly common in the field of teacher education. Nowadays, the two types of simulation most commonly used in SBL are human-based and computer-based simulations. In the following presentation, I will demonstrate the SBL model that I developed, which combines the use of human and virtual elements. This model was developed and implemented during the COVID-19 pandemic but has the potential to serve educators also during routine times. The empirical evidence revealed that using this model makes it possible to adequately address the needs of learners from various cultures and backgrounds and, thus, it promotes equitable learning and teaching. I will first describe the theoretical basis underlying the SBL process as used in teacher-training workshops and explain why this process in effect promotes the notion of "education as hope" in uncertain times. Then, I will demonstrate in real-time how the implementation of the SBL process achieves this desired effect (generating hope and openness to learning). The enactment of the simulation scenario is followed by a group debriefing, in which the focus of the discussion is on the transformation of knowledge into practice, highlighting ideas of critical thinking, conceptual change, and problem-solving. To conclude, we will engage in a group discussion on the affordances of SBL in teacher education in uncertain times, with an eye toward future research collaborations that may enhance our theoretical understanding of uncertainty harnessed as a factor that promotes opportunities for educational change.

Human-based simulation in a virtual space: "walk the talk" of training educators in an uncertain era
Presenting Author: Orna Levin, Achva Academic College, Israel

Please bring your own device if you are attending this ICT demonstration.Simulation-based learning (SBL), which simulates the professional arena for learning and practice purposes, is increasingly common in the field of teacher education. Nowadays, the two types of simulation most commonly used in SBL are human-based and computer-based simulations. In the following presentation, I will demonstrate the SBL model that I developed, which combines the use of human and virtual elements. This model was developed and implemented during the COVID-19 pandemic but has the potential to serve educators also during routine times. The empirical evidence revealed that using this model makes it possible to adequately address the needs of learners from various cultures and backgrounds and, thus, it promotes equitable learning and teaching. I will first describe the theoretical basis underlying the SBL process as used in teacher-training workshops and explain why this process in effect promotes the notion of "education as hope" in uncertain times. Then, I will demonstrate in real-time how the implementation of the SBL process achieves this desired effect (generating hope and openness to learning). The enactment of the simulation scenario is followed by a group debriefing, in which the focus of the discussion is on the transformation of knowledge into practice, highlighting ideas of critical thinking, conceptual change, and problem-solving. To conclude, we will engage in a group discussion on the affordances of SBL in teacher education in uncertain times, with an eye toward future research collaborations that may enhance our theoretical understanding of uncertainty harnessed as a factor that promotes opportunities for educational change.

Keynotes 1

24 August 2023 09:45 - 11:15

AUTH_CH
Keynote

Why Deny? The Psychology of Public Misunderstanding of Science

Keywords: Critical Thinking, Emotion and Affect, Misconceptions, Pandemic
Interest group:
Chairperson: Lucia Mason, University of Padova, Italy

Many individuals are perplexed by family members, friends, and co-workers who avoid vaccinations or believe climate change is a hoax. Democracies depend on educated citizens who can make informed decisions about scientific issues. The COVID-19 pandemic brought these issues into sharp relief. In Science Denial: Why It Happens and What to Do About It, Sinatra and Hofer examine the psychological factors contributing to science doubt, resistance, and denial. This presentation will focus on the themes from the book including the role of psychological constructs such as cognitive biases, emotions, identity, epistemic cognition, and motivated reasoning in public (mis)understanding of science. Sinatra will overview significant motivational and emotional challenges to public understanding of science and provide research-based solutions to each challenge for individuals, educators, policy makers, and science communicators.

Why Deny? The Psychology of Public Misunderstanding of Science
Presenting Author: Gale Sinatra, University of Southern California, United States

Many individuals are perplexed by family members, friends, and co-workers who avoid vaccinations or believe climate change is a hoax. Democracies depend on educated citizens who can make informed decisions about scientific issues. The COVID-19 pandemic brought these issues into sharp relief. In Science Denial: Why It Happens and What to Do About It, Sinatra and Hofer examine the psychological factors contributing to science doubt, resistance, and denial. This presentation will focus on the themes from the book including the role of psychological constructs such as cognitive biases, emotions, identity, epistemic cognition, and motivated reasoning in public (mis)understanding of science. Sinatra will overview significant motivational and emotional challenges to public understanding of science and provide research-based solutions to each challenge for individuals, educators, policy makers, and science communicators.

Keynotes 2

24 August 2023 09:45 - 11:15
HELEXPO_CC
Keynote
Learning and Special Education

Individual Differences in Early Numeracy, Executive Functions, Motor Skills and Physical Activity

Keywords: Early Childhood Education, Learning and Developmental Difficulties, Mathematics/Numeracy, Special Education
Interest group: SIG 15 - Special Educational Needs
Chairperson: Jo Van Herwegen, United Kingdom

My talk focus on our research groups' latest research findings about young children's early numeracy learning and possible learning difficulties in it. We aim to produce new scientific evidence about developmental dynamics in early numeracy, executive functions, motor skills and physical activity. We also control for fine motor and language skills, and family socioeconomic-status. The study line started with an observation that children's physical activity, motor skills and the knowledge of mathematical skills have been decreasing during the last decade. Is it so that an inactive lifestyle causes problems for learning?Empirical evidence from school age children has recently been obtained concerning the positive association between motor and academic performance in cross-sectional and longitudinal paradigms. For instance Diamond (2000) suggested that the close association between motor and cognitive development is mediated by the coactivation of the cerebellum (critical for complex and coordinated movements) and the prefrontal cortex (critical for higher- order cognitive functioning, for example, the executive functions. Early numeracy development has been shown to be associated with children's EF and language skills, but less studies have studied them together particularly with a focus on children with mathematical learning difficulties.We collected longitudinal data from three measurement points with 300 children aged 3-6 years. We have also used the interventions to manipulate the developmental trajectories: we investigate the effects of three interventions: early numeracy and motor skills intervention, motor skills intervention, and early numeracy intervention. Our preliminary results demonstrate a mediating role for executive functions in relation between motor and early numeracy skills. The results from the pilot intervention study suggest that it is beneficial to combine motor and early numeracy skills practice with preschoolers' having low early numeracy performance. In EARLI 2023 I present the results from the longitudinal data set and two intervention studies.

Individual Differences in Early Numeracy, Executive Functions, Motor Skills and Physical Activity
Presenting Author: Pirjo Aunio, University of Helsinki, Finland

My talk focus on our research groups' latest research findings about young children's early numeracy learning and possible learning difficulties in it. We aim to produce new scientific evidence about developmental dynamics in early numeracy, executive functions, motor skills and physical activity. We also control for fine motor and language skills, and family socioeconomic-status. The study line started with an observation that children's physical activity, motor skills and the knowledge of mathematical skills have been decreasing during the last decade. Is it so that an inactive lifestyle causes problems for learning?Empirical evidence from school age children has recently been obtained concerning the positive association between motor and academic performance in cross-sectional and longitudinal paradigms. For instance Diamond (2000) suggested that the close association between motor and cognitive development is mediated by the coactivation of the cerebellum (critical for complex and coordinated movements) and the prefrontal cortex (critical for higher- order cognitive functioning, for example, the executive functions. Early numeracy development has been shown to be associated with children's EF and language skills, but less studies have studied them together particularly with a focus on children with mathematical learning difficulties.We collected longitudinal data from three measurement points with 300 children aged 3-6 years. We have also used the interventions to manipulate the developmental trajectories: we investigate the effects of three interventions: early numeracy and motor skills intervention, motor skills intervention, and early numeracy intervention. Our preliminary results demonstrate a mediating role for executive functions in relation between motor and early numeracy skills. The results from the pilot intervention study suggest that it is beneficial to combine motor and early numeracy skills practice with preschoolers' having low early numeracy performance. In EARLI 2023 I present the results from the longitudinal data set and two intervention studies.

Keynotes 3

24 August 2023 09:45 - 11:15
UOM_CH
Keynote

Journal Writing as Medium for Thinking and Learning

Keywords: Knowledge Construction, Metacognition, Self-regulated Learning and Behaviour, Writing/Literacy
Interest group: SIG 06 - Instructional Design
Chairperson: Eleftheria Gonida, Aristotle University of Thessaloniki, Greece

Journal Writing as Medium for Thinking and Learning: Instructional Support to Foster Self-Regulated LearningWriting, just as reading, is basic to academic learning both in school and at the university. With the advent of a scientific writing pedagogy in the early seventies of the last century, the idea was born that writing is a natural tool for thinking and learning. This idea was first suggested by the educational reform movement "writing across the curriculum" in the UK and soon spread over to many high schools and universities in the USA. By drawing on classic theoretical ideas from writing-research, models of self-regulated learning and cognitive load theory, I will propose the self-regulation view in writing-to-learn as a promising theoretical perspective. According to this perspective,

writing has the potential to scaffold self-regulated learning due to the cognitive offloading written text offers as an external representation and memory aid, and due to the offloading, that specifically results from the genre-free principle in journal writing.I will then present the main tenets of a research program on journal writing – “the Freiburg Self-Regulated-Journal-Writing Approach” – which I conducted with colleagues from the University of Freiburg (Germany) during the last 20 years. In this research program, we developed and tested instructional support methods to help students use the journal writing to enact knowledge construction processes that result in deep comprehension and long-term retention of subject matter, as well as effective preparation for future problem-solving. My discussion of these more than 20 experimental and correlative studies will show that, with appropriate instructional support, journal writing indeed is a valuable medium for thinking and learning that enables students to take responsibility for their own learning process, by helping them to recognize their individual learning needs and develop their ideas about complex subject matter issues. Fostering such self-regulated learning competence is both an important goal and hope of education particularly in uncertain times.

Journal Writing as Medium for Thinking and Learning
Presenting Author: Matthias Nückles, University of Freiburg, Germany

Journal Writing as Medium for Thinking and Learning: Instructional Support to Foster Self-Regulated LearningWriting, just as reading, is basic to academic learning both in school and at the university. With the advent of a scientific writing pedagogy in the early seventies of the last century, the idea was born that writing is a natural tool for thinking and learning. This idea was first suggested by the educational reform movement “writing across the curriculum” in the UK and soon spread over to many high schools and universities in the USA. By drawing on classic theoretical ideas from writing-research, models of self-regulated learning and cognitive load theory, I will propose the self-regulation view in writing-to-learn as a promising theoretical perspective. According to this perspective, writing has the potential to scaffold self-regulated learning due to the cognitive offloading written text offers as an external representation and memory aid, and due to the offloading, that specifically results from the genre-free principle in journal writing.I will then present the main tenets of a research program on journal writing – “the Freiburg Self-Regulated-Journal-Writing Approach” – which I conducted with colleagues from the University of Freiburg (Germany) during the last 20 years. In this research program, we developed and tested instructional support methods to help students use the journal writing to enact knowledge construction processes that result in deep comprehension and long-term retention of subject matter, as well as effective preparation for future problem-solving. My discussion of these more than 20 experimental and correlative studies will show that, with appropriate instructional support, journal writing indeed is a valuable medium for thinking and learning that enables students to take responsibility for their own learning process, by helping them to recognize their individual learning needs and develop their ideas about complex subject matter issues. Fostering such self-regulated learning competence is both an important goal and hope of education particularly in uncertain times.

Session I 1

24 August 2023 12:00 - 13:30
AUTH_CH
Invited Symposium

The Effects of Social and Emotional Learning on Children’s Cognitive and Psychological Wellbeing

Keywords: Cognitive Development, Cognitive Skills and Processes, Cultural Diversity in School, Early Childhood Education, Educational Neuroscience, Emotion and Affect, Inclusive Education, Multicultural Education, Pandemic, Primary Education, Resilience, Secondary Education, Social Aspects of Learning and Teaching
Interest group:
Chairperson: Katariina Salmela-Aro, Helsinki University, Finland
Chairperson: Barbara Schneider, Michigan State University, United States
Discussant: Felice Levine, American Educational Research Association, United States

This invited symposium of four international experts, highlight recent findings regarding the importance of placing more emphasis on social and emotional learning especially with respect to equity and inclusion. The symposium opens with a presentation from Dr. Vincent-Lancrin, the Deputy Head of the Centre for Educational Research and Innovation (CERI) and a Senior Analyst at the Organisation for Economic Co-operation and Development (OECD), who describes the impact of COVID-19 on cognitive achievement and other societal disruptions such as geopolitical conflicts and sets the backdrop to the focus on social and emotional learning and children’s psychological well-being. Professor Motti-Stefanidi from the National and Kapodistrian University of Athens, discusses the evidence from the Athena Studies of Resilient Adaptation project on immigrant students’ psychological well-being in the Greek school context, where systemic and structural discrimination against immigrants has prompted assimilation policies to achieve a more equitable educational system. Dr. Suad Nasir, President of the Spencer Foundation, which conducts and supports high quality educational research, will discuss results from studies directed at improving the social and emotional learning of all children. Finally, Dr. Schneider the John A. Hannah University Professor from Michigan State University provides new results obtained from elementary and secondary students indicating how and when students social and emotional learning is enhanced when engaged in cognitive educative experiences.

The effects of COVID on learning outcomes and equity: international outcomes
Presenting Author:STEPHAN VINCENT-LANCRIN, OECD, France

The symposium opens with a presentation from Dr. Vincent-Lancrin, the Deputy Head of the Centre for Educational Research and Innovation (CERI) and a Senior Analyst at the Organisation for Economic Co-operation and Development (OECD), who describes the impact of COVID-19 on cognitive achievement and other societal disruptions such as geopolitical conflicts and sets the backdrop to the focus on social and emotional learning and children’s psychological well-being.

Immigrant and non-immigrant youth’s educational and socio-emotional competence
Presenting Author:FROSSO MOTTI, National and Kapodistrian University of Athens, Greece

Immigrant and non-immigrant youth’s educational and socio-emotionalcompetence: Who does well and why?Professor Motti-Stefanidi from the National and Kapodistrian University of Athens, discusses the evidence from the Athena Studies of Resilient Adaptation project on immigrant students’ psychological well-being in the Greek school context, where systemic and structural discrimination against immigrants has prompted assimilation policies to achieve a more equitable educational system.

Connecting Emotion, Cultural Context and Learning: Insights from Learning Science and Neuroscience
Presenting Author: Na'ilah Nasir, Spencer Foundation, United States

Dr. Suad Nasir, President of the Spencer Foundation, which conducts and supports high quality educational research, will discuss results from studies directed at improving the social and emotional learning of all children.

Tracking Adolescents’ Social and Emotional Supports During Optimal Learning Moments
Presenting Author: Barbara Schneider, Michigan State University, United States

Finally, Dr. Schneider from the John A. Hannah University Professor from Michigan State University provides new results obtained from elementary and secondary students indicating how and when students social and emotional learning is enhanced when engaged in cognitive educative experiences.

Session I 2

24 August 2023 12:00 - 13:30
UOM_CH
Invited Symposium

Assessment and Evaluation

The Social Dimensions of Peer Assessment

Keywords: Classroom Assessment, Cooperative/Collaborative Learning, Feedback, Gender Issues, Higher Education, Mixed-method Research, Peer Interaction, Secondary Education, Social Aspects of Learning and Teaching, Writing/Literacy
Interest group: SIG 01 - Assessment and Evaluation
Chairperson: Tijs Rotsaert, Ghent University, Belgium
Organiser: Jose Carlos Ocampo, University of Deusto, Spain
Organiser: Morgane Senden, Université catholique de Louvain (UCL), Belgium
Discussant: Javier Fernández, Universidad de Leon, Spain

Peer assessment has been widely used in a variety of academic disciplines and educational levels due to its documented educative benefits. Since peer assessment is social and collaborative in nature, attention to the social nature of peer assessment has been increasing in recent years. This symposium presents theoretical and empirical evidence on the interplay between social variables and other contextual factors that influence peer assessment. The first contribution, by Alqassab et al., introduces the Multi-level Multi-process Interactive Peer Assessment (M^2IPA) framework that integrates both the overt and covert processes of peer assessment and its possible outcomes. Additionally, this framework considers how peer assessment can be influenced by learners' individual characteristics and the contextual factors that underlie it. On the other hand, the second contribution, by Aben et al., investigates whether cognitive sub-phases of the process of dealing with errors can be distinguished during peer-feedback provision and processing, as well as the extent to which this process is related to interpersonal factors in secondary students' argumentative writing outputs. The third contribution, by Ocampo et al. examines the effects of assessor's gender and peer feedback content on men and women assessees' academic performance, and perceptions of peer feedback a writing focused task. Finally, in the fourth contribution, Senden and Coertjens investigate the effect of an intervention designed to enhance students' feelings of trust during peer assessment via training, and back-evaluation. Implications for teaching and assessment practice and future directions for research will be addressed.

Peer assessment as a multi-level multi-process interactive practice: The M2IPA framework
Presenting Author: Maryam Alqassab, Universidad de Las Palmas de Gran Canaria, Spain; **Co-Author:**Jan-Willem Strijbos, University of Groningen, Netherlands; **Co-Author:**Stefan Ufer, Ludwig-Maximilians-Universität (LMU), Germany

Peer assessment is nowadays considered a central learning activity in schools and higher education. Various theoretical attempts to capture learning from peer assessment exist. However, there seems to be an unbalanced emphasis in these models either on (a) processes involved in peer assessment or (b) processes influencing the effectiveness of this learning activity. In this contribution we propose a framework that integrates the pre-existing theoretical models on peer assessment and provides a more holistic description of peer assessment as a learning activity. Unlike prior theoretical contributions, the Multi-level Multi-process Interactive Peer Assessment (M^2IPA) framework takes into account the effects of covert processes, individual factors and interpersonal factors, while describing overt processes of peer assessment (e.g., judging peer performance, providing feedback) and their subsequent outcomes (e.g., feedback message vs. self-regulation). We argue that this holistic description of peer assessment offered by the M^2IPA framework can support the development of better understanding of peer assessment as a learning activity and facilitate the design of peer assessment activities in different learning environments.

Dealing with errors while providing and processing peer-feedback on texts: A mixed-methods approach
Presenting Author: Jochem Aben, University of Nijmegen, Netherlands; **Co-Author:**Mayra Mascareño Lara, University of Groningen, Netherlands; **Co-Author:**Anneke Timmermans, University of Groningen, Netherlands; **Co-Author:**Filitsa Dingyloudi, University of Groningen, Netherlands; **Co-Author:**Jan-Willem Strijbos, University of Groningen, Netherlands

Although previous research has stressed the central role of errors during feedback processes, the role of errors may depend on interpersonal relationships between actors involved in feedback activities. Therefore, this study investigates, in the context of peer-feedback on argumentative writing, (1) which cognitive sub-phases are distinguishable during the process of dealing with errors and (2) the extent to which dealing with errors relates to the interpersonal relationship. Six dyads of Dutch 11th grade students provided and processed peer-feedback on argumentative texts while thinking-aloud, and they reflected on the feedback-processes in a post-interview. The think-aloud utterances and interviews were analyzed with a mixed-methods, exploratory sequential design, applying a quantitative content analysis, and a qualitative thematic analysis. The dealing with errors during the provision of peer-feedback displayed two patterns. In the first pattern, error identification seemed to happen simultaneously with the decoding, and often any evaluation-related thoughts were lacking. In the second pattern, error-identification seemed to occur as a result of an interpreting/evaluating phase. Also during the processing of peer-feedback, two main patterns were visible: students either knew immediately whether they agreed with a feedback remark, or they first had to study the feedback remark more thoroughly. Additionally, 10/12 students *seemed* (in the think-aloud data) to be affected by the interpersonal relationship with the feedback recipient while providing feedback, whereas they *declared* (in the interviews) not to be so. By contrast, 8/12 students did declare (in the interviews) to be affected by the interpersonal relationship with the feedback provider while processing feedback.

The impact of training and backward evaluation on students' feeling of trust during peer feedback
Presenting Author: Morgane Senden, Université catholique de Louvain (UCL), Belgium; **Co-Author:**Liesje Coertjens, Université catholique de Louvain (UCL), Belgium

Peer feedback can have a very positive impact on students' learning, but only if students have at least some trust in themselves and their peers' abilities to provide feedback, which is often not the case. To enhance these feelings of trust, we created an intervention composed of two elements (1) the provision of a training session that aims to improve trust and (2) the presence of backward evaluation and implement it in a course with multiple peer feedback activities. We tested the intervention's efficacy through a quasi-experimental study with 144 education master students. We hypothesise that students who will receive the intervention will have a higher increase in their feeling of trust, the quality of the feedback they will provide and their performance than students who will participate in peer feedback without the intervention.

Gender and Peer Feedback Content's Effects on Academic Performance and Peer Feedback Perceptions
Presenting Author: Jose Carlos Ocampo, University of Deusto, Spain; **Co-Author:**Ernesto Panadero, Universidad Deusto, Spain; **Co-Author:**Fernando Díez, Universidad de Deusto, Spain; **Co-Author:**Iván Sánchez-Iglesias, Universidad Complutense de Madrid, Spain

The role of gender in peer feedback has received increasing attention in recent years. When providing peer feedback, studies suggest that women may tend to give better quality peer feedback, and be more comfortable in doing so. When receiving feedback, literature forwards that women assessees are more likely to implement peer feedback on their work. However, studies have not yet examined if peer feedback is more likely to be implemented based on the assessor's gender. This is crucial as literature has warned against the possibility of gender stereotypes in peer feedback. When not managed, this may affect students' perceptions of peer feedback, which may influence various outcomes. In this study, we examined the effects of gender and peer feedback content on academic performance, and perceptions of peer feedback. Our participants submitted an essay where they received concise general or elaborated specific peer feedback from a fictitious male, female, or anonymous peer assessor in a computer-supported collaborative learning platform. After going through the peer feedback, participants answered a peer feedback perceptions questionnaire, and submitted a revised version of the essay. Our preliminary result suggests that women scored higher in the pre-test version of the essay. Also, men reported that they experienced negative affect when going through the peer feedback given by an anonymous and by a women assessor. We suggest for the implementation of training to support students' emotions when receiving peer feedback.

Session I 3

24 August 2023 12:00 - 13:30
UOM_A13
Symposium

Teaching and Teacher Education

The Development of Core Practices from a Cross-National Perspective

Keywords: Feedback, Learning Strategies, Motivation, Pre-service Teachers, Teacher Professional Development, Teaching Approaches, Teaching/Instructional Strategies
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Pamela Grossman, University of Pennsylvania, United States
Chairperson: Urban Fraefel, Switzerland
Discussant: Tina Seidel, Technische Universität München, Germany

The turn towards practice-based teacher education has been well documented in the US. This symposium aims to provide researchers and teacher educators in teacher education with an early sense of how the ideas and approaches related to practice-based teacher education are being taken up by universities in Europe. The institutional efforts share common ground around their commitment to placing practice at the center of their curriculum.We understand core practices in teaching as identifiable components fundamental to teaching, grounded in disciplinary and pedagogical goals that teachers enact to support learning. Core practices consist of the enactment of knowledge, beliefs, and dispositions through pedagogical approaches, strategies, routines, and moves that can be unpacked and learned by teachers. Core practices recognize the highly intersubjective and complex nature of teaching and are deeply connected to the goals of disciplinary learning.The focus on core practices in teacher education research and practice has developed significant momentum in the second decade of this century. Professionals in Germany, Norway, the Netherlands, and Switzerland continue to develop the concept, in interaction with local contexts, and research how the concept of core practices can best contribute to the practical preparation of pre-service and in-service teachers. Specific elements of this work will be presented in the symposium. Discussion with the discussant and participants will include what to focus on in researching and developing the use of core practices in the near future.

A motivational perspective on learning core practices: the case of a Dutch teacher education program
Presenting Author: Hanna Westbroek, Vrije Universiteit, Amsterdam, Netherlands; **Co-Author:**Anna Kaal, University of Amsterdam, Netherlands; **Co-Author:**Sebastiaan Donszelmann, University of Amsterdam, Netherlands

This contribution presents how motivational aspects of mastering core practices were addressed in a Dutch PBTE program (1 year). Two design principles guided the design of our program: 1. Provide student teachers with opportunities to encounter, explicate and examine *personal learning needs*. 2. New core practices should be ‘practically useful’ to students. We discuss two courses that were based on these design principles: a general course that offers student teachers a sequence of core practices in a blended learning approach, and a course, 4 months course that takes teaching practices that student teachers have developed as a starting point. In this contribution we will illustrate key features of the program with the case of Nicole, a representative student teacher. Both courses were evaluated with a survey (general course, n=43/48 total; GSR course n=20/50 total). Additionally, structured focus group interviews were conducted to gain more insight in student experiences (two hours, one group of three student teachers and three groups of two students). Results show that the general, adaptive features of the program are recognized and generally positively valued by student teachers.

Using Core Practices to Improve Connections between Theory and Practice in Teacher Education
Presenting Author: Kirsti Klette, University of Oslo, Norway; **Presenting Author:**Inga Staal Jenset, University of Oslo, Norway; **Co-Author:**Gøril Brataas, University of Oslo, Faculty of Education, Norway

Researchers around the world agree on the importance of connecting theory and practice in teacher education, and many programs are adopting practice-based teacher education and core practices of teaching as a way to do so. In this paper, we report on redesign efforts from a five-year secondary university-based teacher education program in Norway, using two illustrative examples of how attention to core practices was used to strengthen TCs’ opportunities to study and enact authentic teaching practices during coursework. Data sources include candidate surveys, logs and interviews from the teacher candidates, as well as fieldwork observation data. Findings underscore how systematic focus on core practices like Feedback, Modeling and Strategy Use and Instruction support candidates’ analytical gaze through decompositions of multiple representations of practice (e.g., videos of teaching, teaching materials and lesson plans). Our findings indicate that attention to core practices of teaching during coursework can indeed influence candidates teaching practice, and point to the importance of combining attention to core practices of teaching with attention the specific context of the teaching, and the overall purpose of education.

How Can the Acquisition of Core Practices be optimally fostered? A Research Agenda and First Results
Presenting Author: Hadmut Hipp, Albert-Ludwigs-Universität Freiburg, Germany; **Co-Author:**Anna Holstein, Leuphana University Lueneburg, Germany; **Co-Author:**Matthias Nückles, University of Freiburg, Germany; **Co-Author:**Marc Kleinknecht, Leuphana University Lueneburg, Germany

Recently, the notion of core practices has been suggested as principle around which teacher education may be organized. A strength of the core-practices concept is that the concrete and situated demands of teaching come into focus. We have developed an experimental research program, in which we investigate how the training of core practices should be optimally designed. Our program is based on a theoretical discussion of the Learning Cycle by McDonald et al. (2013), Anderson’s (1982) skill acquisition model ACT-R, and Kapur’s (2008) Productive Failure. This interdisciplinary discussion has spawned several research questions which we believe are fundamental to the teaching of core practices: Which phases should a core practice training be composed of? Which sequence of phases supports core practice acquisition best? What is the added value of approximations of practice (e.g., microteaching with peers)? Which benefit results from peer- and expert feedback?In our presentation, we will start with an overview of our discussion of the aforementioned theoretical approaches. Then follows a first intervention study in which we addressed the composition and the sequencing question. Results suggest that offering preservice teachers the opportunity to enact a core practice independently with students was more beneficial than simply having them reflect on the performance of a teacher modelling the core practice. Nevertheless, in line with the Learning Cycle and ACT-R, independent enactment of the core practice was most successful if preservice teachers studied the modelling example and a principle-based explanation of the core practice as preparation to the enactment phase.

Supporting teachers’ learning through co-planning, rehearsing and co-enacting instruction
Presenting Author: Kjersti Waege, Norwegian University of Science and Technology (NTNU), Norway; **Presenting Author:**Janne Fauskanger, University of Stavanger, Norway; **Co-Author:**Reidar Mosvold, University of Stavanger, Norway

The *Mastering Ambitious Mathematics teaching* professional development and research project (MAM) takes a core-practices approach to supporting in-service teachers’ development of ambitious mathematics teaching by inviting them into learning cycles of enactment and investigation. Whereas multiple studies have analysed opportunities for learning in particular settings, this study investigate opportunities for learning core practices of ambitious teaching as they were emphasized in co-planning, rehearsals and co-enactments. Findings indicate that different practices were emphasized in different settings and the participants focused on different aspects of the practices in the three settings. It is thus important to include all three settings in future professional development.

Session I 4

24 August 2023 12:00 - 13:30
UOM_A08
Symposium
Teaching and Teacher Education

Obstacles and Opportunities: New insights into (student) teachers' attitudes on inclusive education

Keywords: Assessment Methods, Attitudes and Beliefs, In-service Teachers, Inclusive Education, Pre-service Teachers, Self-efficacy, Special Education, Teacher Professional Development
Interest group: SIG 15 - Special Educational Needs
Chairperson: Charlotte Sophie Schell, German Institute for International Educational Research (DIPF); IDeA-Research Center, Germany

Chairperson: Hannah Kleen, Germany
Organiser: Charlotte Sophie Schell, German Institute for International Educational Research (DIPF); IDeA-Research Center, Germany
Organiser: Charlotte Dignath, TU Dortmund University, Germany
Organiser: Hannah Kleen, Germany
Discussant: Sabine Glock, Bergische Universität Wuppertal, Germany

As the United Nations have been promoting the inclusion of students with special educational needs (SEN) into regular classrooms, (prospective) teachers feel faced with new opportunities, but also with obstacles for their teaching. Teachers' attitudes towards students with SEN and their inclusion play a major role in how (student) teachers (will) manage to successfully implement inclusion in their classrooms. The goal of this symposium is to shine a light on those attitudes of (student) teachers as well as related constructs in this relatively young field of research. The symposium starts with an overview of similarities and differences in the attitudes student teachers hold towards pupils with different SEN. Since teachers' attitudes towards pupils with SEN may affect their attitudes towards inclusion, the second contribution presents a validation study on a scale to measure teachers' general as well as personal attitudes towards inclusion. As personal attitudes are related to professional training, the third study firstly presents a meta-analysis on the relation of attitudes and self-efficacy and secondly investigates the causality between those two constructs. Coming from an individual level to a systemic one, the symposium concludes with a study investigating the relation between teachers' attitudes towards inclusion and systemic values. This symposium aims to provide more detailed information about teacher attitudes and related constructs that may affect the inclusion of pupils with SEN into regular classrooms, by combining research on attitudes towards pupils with SEN, attitudes towards inclusive education, self-efficacy beliefs regarding the implementation of inclusion, and systemic values regarding inclusion.

Investigating Student teachers' attitudes towards children with special educational needs
Presenting Author: Charlotte Sophie Schell, German Institute for International Educational Research (DIPF); IDeA-Research Center, Germany; **Co-Author:**Charlotte Dignath, TU Dortmund University, Germany; **Co-Author:**Hannah Kleen, German Institute for International Educational Research (DIPF); IDeA-Research Center, Germany; **Co-Author:**Mareike Kunter, German Institute for International Educational Research (DIPF); IDeA-Research Center, Germany

Practice and research show that stereotypes about learners with special educational needs (SEN) are widespread in society and also present among student teachers. Such stereotypes could be barriers to professional diagnosis if they lead to overlooking or overestimating certain student information. In this study, we aim to describe student teachers' stereotype content of children with SEN focussing on children with Down syndrome, autism spectrum disorder and learning difficulties. In a first and qualitative study, we interviewed a sample (N = 13) of different student teachers about potential stereotypes. In the second and quantitative study (N = 213), we build on these answers constructing a questionnaire to measure and verify those stereotypes and additionally assessed stereotypes using the Stereotype Content Model by Fiske et al. (2002). The results showed distinctive stereotype content for students with Down syndrome, autism spectrum disorder and learning difficulties.

Development of the Teacher Attitude to inclusion Scale
Presenting Author: Christopher Boyle, University of Adelaide, Australia; **Co-Author:**Joanna Anderson, University of New England, Australia

Providing an effective and high-quality education for all children and young people remains a significant challenge throughout the world. Disputes and contradictions contribute to the prevailing debate as to the justification and merits of inclusive education. One of the reoccurring themes within the literature on inclusive education is the relationship between the successful application of teachers' knowledge, skills, and abilities utilised to include inclusive strategies in their classrooms, and their attitude towards inclusion. A teacher with more positive attitudes will be more accepting of students, build more successful relationships with them, aid in a child's sense of belonging, student academic success and social integration. To address this issue, the Teacher Attitudes to Inclusion Scale (TAIS) was developed by the first author to measure the attitudes of qualified (in-service) teachers towards inclusive education. Using an Exploratory Principal Components Analysis and Reliability, a revised version of the TAIS, the TAIS-R provides a psychometrically validated measure of two constructs – a global attitude and a personal attitude towards inclusive education that provides an accurate evaluation tool for research and practice.

Teacher attitudes towards inclusion – the role of self-efficacy believes
Presenting Author: Hannu Savolainen, University of Eastern Finland, Finland; **Co-Author:**Akie Yada, University of Jyväskylä, Finland; **Co-Author:**Susanne Schwab, University of Vienna, Austria

Teacher attitudes towards inclusion (TA) are often regarded as one major obstacle on the way towards more inclusive education as attitudes seem to be related to teacher behavior. Teachers' self-efficacy believes (TSE) are important for the successful implementation of inclusive education. While systematic reviews are existing for TA (e.g. Avramidis & Norwich, 2002; de Boer et al., 2011), and plenty of studies have examined the relation between TA and TSE, but a meta-study about the relation between TA and TSE is currently missing. Further, the direction of causality between the concepts can be questioned. Study 1 is a meta study including 41 studies. The selection of this studies was based on the RISMA statement protocol using several databases (e.g. ERIC, WoS, EBSCOhost). A sample size weighted correlation coefficient between teachers attitudes and TSE of r = 0.35 was found. Neither sample characteristic nor publication characteristics moderated this correlation. Study 2 was conducted as an electronic survey including data from 1326 Finish teachers. TSE was available at five measurement points and teachers attitudes at three measurement points. The results of a cross-lagged analysis showed high stability of both constructs. The result suggest that the direction of causality is such that TSE predicts teachers' attitudes rather than vice versa. The findings of the two studies imply that increasing TSE might be a way to improve teacher attitudes in the future. Therefore, ways to support TSE need to be addressed pre- and in-service teacher education.

Enhancing values in the educational system: effects on teachers attitudes toward inclusive education
Presenting Author: Anne-Laure PERRIN, University of Lille -PSITEC - EA 4072, France; **Co-Author:**Mickaël Jury, Clermont Auvergne University, France; **Co-Author:**Caroline Desombre, Université de Lille, France

To enable inclusive education values, organization, and functioning of the educational system have been reshaped (Bonvin et al., 2013) but some barriers remain, and among them teachers' attitudes toward inclusive education. These attitudes are notably related to teachers' values (Perrin et al., 2021). Due to the values the educational system also conveys, we assume that making salient those known to be positively linked to attitudes could enhance more positive attitudes among teachers in comparison with a control condition or with negatively linked values. To test this hypothesis, 527 volunteer teachers were randomly assigned to 4 experimental conditions enhancing specific values in a fictitious front page of a teachers' monthly magazine that they had to read before completing a measure of attitudes toward inclusive education. Results partially support the hypothesis but support the idea that the values promoted by the educational system could influence teachers' attitudes toward inclusive education, and open up prospects for enhancing inclusive policies and finally making inclusion an undeniable success.

Session I 5

24 August 2023 12:00 - 13:30
UOM_A02
Symposium
Cognitive Science, Learning and Special Education

The neural, (non-)cognitive and home predictors of individual differences in childhood learning

Keywords: Cognitive Development, Developmental Processes, Educational Neuroscience, Gifted and Talented Students, Learning and Developmental Difficulties, Mathematics/Numeracy, Quantitative Methods, Reading, Special Education
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 15 - Special Educational Needs
Chairperson: Jessica Vergeer, Radboud University Nijmegen, Behavioural Science Institute, Netherlands
Organiser: Bob Kapteijns, Behavioural Science Institute, Radboud University Nijmegen, Netherlands
Discussant: Daniel Ansari, University of Western Ontario, Canada

Individual differences at young ages are predictive of educational outcomes in later school years. It is essential for researchers and educators alike to recognize individual differences between children, in order to optimally meet their educational needs.

This symposium will present findings from multiple domains of research, providing different yet overlapping perspectives on the neural, cognitive, non-cognitive, and familial/home factors that underlie individual differences in childhood learning trajectories. Different theoretical and methodological approaches are presented, ranging from more explorative child-oriented approaches to large-scale neurodevelopmental cohort studies.
The first contribution will present results from a quantitative study on the home, school and cognitive predictors of early numeracy and literacy development in a large sample of 220 kindergartners.
The second contribution presents multivariate analyses of neuroimaging data from children and their mothers and discusses familial influences on the neural correlates of numerical and literacy performance, as well as the neural resources that are shared between both domains.
The third contribution has implemented generative network modelling to provide a computational framework for understanding neurodevelopmental diversity in a large sample of neurodiverse children (n=270).
The fourth contribution uses Latent Class Analysis (LCA) to explore profiles of non-cognitive characteristics in a small neurodiverse sample of twice-exceptional learners, to examine whether the profiles of these characteristics transcend traditional boundaries of classification.

Methodologies and findings from these studies will shed new light on the factors underpinning individual differences in childhood learning and development. Various scientific and educational implications will be addressed throughout this symposium.

Home, school and cognitive predictors of individual differences in early math and reading skills
Presenting Author: Bob Kapteijns, Behavioural Science Institute, Radboud University Nijmegen, Netherlands; **Co-Author:**Anne van Hoogmoed, Radboud University, Netherlands; **Co-Author:**Marco van de Ven, Radboud University, Netherlands; **Co-Author:**Evelyn Kroesbergen, Radboud University, Netherlands; **Co-Author:**Rogier Kievit, Radboud University, Netherlands

The development of early math and reading skills, and their relationship with ‘general’ cognitive development, has been the subject of much investigation throughout recent years. Still, a comprehensive framework of the interrelations between math, reading and general cognitive development in early childhood is lacking. In this ongoing project, we are conducting a longitudinal investigation of early cognitive, numerical and literacy development over a period spanning from kindergarten until the second grade of primary school in a large sample of children (n=220). School and home predictors (e.g., parental activities and expectations) are investigated as well, in order to examine the roles of various environmental factors in these learning trajectories.
Ultimately, this project aims to investigate the ways in which executive functioning (EF), working memory (WM) and fluid intelligence dynamically develop over time, and how they may interact bidirectionally with number sense, early numeracy and early literacy development. Taken together, this approach will help us to better understand individual differences in the dynamic relationships between various components of early child development.
Data collection for this longitudinal project is currently ongoing. The project consists of five separate time points, spanning approx. 2,5 years. The first wave of data is being collected in the Fall of 2022, and the second wave will be collected in the Spring of 2023 (February through April). Therefore, this presentation will present results from the first two time points.

Familial influences on the neural correlates of Math and Reading
Presenting Author: Aymee Alvarez Rivero, University of Western Ontario, Canada; **Co-Author:**Lien Peters, The University of Western Ontario, Canada; **Co-Author:**Daniel Ansari, University of Western Ontario, Canada

Math and reading are fundamental academic skills that have been largely studied. Multiple behavioral, longitudinal and genome-wide association studies have revealed strong associations between these skills. However, the neuroimaging evidence about shared neural correlates between both domains is still scarce. We also know that reading and math abilities are highly heritable. However, studies directly comparing the functional organization of the neural pathways that support math and reading from parents to children are still lacking. In the current study, we aim to use fMRI combined with multivariate methods to assess similarities in the neural patterns of brain activation associated with phonological decoding and arithmetic in a group of 47 children and their mothers. By administering the same neurocognitive tasks to both mothers and children we aim to uncover familial influences in the functional organization of the brain regions engaged during reading and math. Preliminary analyses of behavioral data point to significant associations between children’s reading and math abilities, as well as significant associations between mother-child reading and math performance. In addition, preliminary univariate analyses of neuroimaging data have revealed at least three clusters that are significantly active during both reading and arithmetic. Further analysis using RSA will reveal whether these clusters also display similar patterns of distributed activation across multiple voxels for math and reading, and whether we can use these patters to identify child-mother dyads.

CANCELLED: Modelling neurodiversity with a generative approach
Presenting Author: Danyal Akarca, University of Cambridge, UK, United Kingdom; **Co-Author:**Petra E. Vértes, Department of Psychiatry, University of Cambridge, United Kingdom; **Co-Author:**Edward T. Bullmore, Department of Psychiatry, University of Cambridge, United Kingdom; **Co-Author:**the CALM team, MRC Cognition and Brain Sciences Unit, University of Cambridge, United Kingdom; **Co-Author:**Duncan E. Astle, MRC Cognition and Brain Sciences Unit, University of Cambridge, United Kingdom

This presentation has been cancelled and will not be presented at EARLI 2023.Individual differences in childhood developmental trajectories can be measured at a range of different levels, including behaviour, cognition and the brain. But what drives these differences over time? At the level of the brain, the continual refinement and change in brain networks represents crucial developmental processes that can drive individual differences in cognition and which are associated with multiple neurodevelopmental conditions. But what mechanisms drive diversity in brain organization? In this work, we use generative network modelling to provide a computational framework for understanding neurodevelopmental diversity in a large sample of neurodiverse children (n=270) from the Centre for Attention, Learning and Memory (CALM) cohort. Within this framework, macroscopic brain organization is an emergent property of a generative model that shapes brain connectivity by renegotiating its biological costs with its topological values continuously over time. The rules governing the model are controlled by a set of tightly framed parameters, with subtle differences in these parameters steering brain network growth towards different neurodiverse outcomes that are associated with the child’s cognition, including e.g. math performance. Importantly, for each child, we can estimate a model that best explains their individual trajectory – giving us a way to clearly conceptualize individual differences in childhood development.

Non-cognitive characteristics in a sample of (presumable) twice-exceptional students
Presenting Author: Marielle Wittelings, Behavioural Science Institute, Radboud University Nijmegen, Netherlands; **Co-Author:**Lianne Hoogeveen, Radboud University, Netherlands; **Co-Author:**Evelyn Kroesbergen, Radboud University, Netherlands

Research has underlined the importance of identifying student’s non-cognitive characteristics in addition to their cognitive characteristics to inform identification and intervention practices. However, recognizing non-cognitive characteristics can be a challenging task for (educational) professionals, especially when students show characteristics of giftedness and co-occurring learning, developmental, and/or behavioural disabilities (twice-exceptional students). At the same time, it is questioned whether differentiation based on classifications will lead to more insights, and research in other psychological domains suggested studying individual symptoms, their patterns, and associations. The aim of this study was therefore to explore whether profiles of non-cognitive characteristics in a small sample (n = 35) of (presumable) twice-exceptional students transcend the boundaries of classifications. Both student and parent questionnaire data were derived from a larger research project on the identification and educational adjustments for (presumable) twice-exceptional students in Dutch primary and secondary education. The students' (66.7% male) ages ranged between 5-16 years and parents' (71.4% female) ages ranged between 30-53 years. Student and parent questionnaires measuring different non-cognitive characteristics are analyzed using Latent Class Analysis (LCA). The first findings of this exploratory study show (large) variation on non-cognitive characteristics. Additionally, upcoming results from the LCA are aimed to reveal if there are profiles of non-cognitive characteristics underlying this variation and to investigate if this may be explained by the students’ classification or not. Findings are informative for

both the theoretical debate on classifications and future research designs, as well as for potentially identifying student's non-cognitive characteristics and educational needs within the educational practice.

Session I 6

24 August 2023 12:00 - 13:30
UOM_A04
Symposium
Assessment and Evaluation

Self-assessment: how students do it, how accuracy develops over time and the role of feedback

Keywords: Achievement, Assessment Methods, Classroom Assessment, Feedback, Higher Education, Secondary Education
Interest group: SIG 01 - Assessment and Evaluation
Chairperson: Leire Pinedo, Universidad de Deusto, Spain
Organiser: Leire Pinedo, Universidad de Deusto, Spain
Organiser: Laurie Delnoij, Maastricht University SBE, Ts 53, Netherlands
Discussant: Juuso Henrik Nieminen, The University of Hong Kong, Finland

Self-assessment is a crucial instructional practice that can help students develop their evaluative judgments and self-regulatory processes. To make sure self-assessment is effective and meaningful in practice, we need insight into how students' ability to self-assess accurately develops (over time), the processes involved in self-assessing, and the role of feedback in scaffolding this crucial skill. Therefore, in this symposium, we synthesize research on these topics conducted in diverse educational contexts using both qualitative as quantitative approaches. In the first two contributions, self-assessment accuracy is discussed from two different perspectives. The first contribution addresses how self-assessment accuracy develops over time and relates to performance in quantitative methods in higher education. This presenter also discusses the role of general feedback in self-assessment. The second paper will go beyond by comparing the effect of elaborated feedback versus a rubric on self-assessment accuracy in secondary education. Then, we shift the focus from accuracy to underlying mechanisms, i.e., what actually happens in the self-assessment process. The third paper examines students' real-time cognitive and affective processes using rubrics and exemplars to self-assess their analytical writing in secondary education. The fourth contribution takes it even further by identifying self-assessors' profiles as well as the effects of feedback on self-assessment in both secondary and higher education. By integrating the insights from these four presentations, we aim to advance empirical knowledge on the topic. Specifically, we unravel the (inner) processes of self-assessment and discuss how self-assessment practice can be improved through feedback.

Self-assessment accuracy over time, the role of general feedback and performance in higher education
Presenting Author: Laurie Delnoij, Maastricht University SBE, Ts 53, Netherlands; **Co-Author:**Christian Kerckhoffs, Maastricht University, School of Business and Economics, Netherlands; **Co-Author:**Therese Grohnert, Maastricht University, Netherlands; **Co-Author:**Simon Beausaert, Maastricht University, Netherlands

To improve performance, students need to be effective self-regulated learners. They should know what their abilities are, monitor their progress, and determine the next steps in learning. Self-assessment is a promising instructional strategy to support students in this. This study explored self-assessment (accuracy) in relation to practice testing in an 8-week quantitative methods course at a first-year undergraduate university level (N = 1336). At the end of each week, an initial multiple-choice practice test took place in which students also estimated the number of items answered correctly. Feedback involved their score, the correct answers alongside references to the study material, and a general statement that overconfident students would benefit from participating in repeated practice testing. Students could opt for repeated practice testing the same content (with different test items) until the initial practice test on the next week's course content. Exploratory correlational analyses replicate the robust testing-effect by confirming that both singular practice testing and repeated practice testing relate positively to end-of-course performance. Regarding the self-assessment effects, we found minor evidence for the expectation that initially overconfident students would be more likely to participate in repeated practice testing. Additionally, we expected that self-assessment accuracy would develop positively over time, which did not appear to be the case. Also, self-assessment accuracy was not related to end-of-course performance. In the EARLI symposium, we aim to focus on implications for self-assessment practice, for example, by discussing the relevance of personalized feedback and student agency in choosing the content of practice tests and self-assessment.

How to improve students' self-assessment accuracy? Rubrics versus elaborated feedback
Presenting Author: Lucas Liebenow, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**Johanna Fleckenstein, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**Jennifer Meyer, IPN - Leibniz Institute for Science and Mathematics Education, Germany

Self-assessment accuracy is essential for effective self-regulated learning and can foster academic performance. Elaborated feedback and rubrics both have the potential to improve the accuracy of student self-assessment, but there is a significant lack of empirical research comparing effect sizes. Therefore, this study examines the question whether the effect of elaborated feedback on self-assessment accuracy is larger compared to a rubric. In total, 130 secondary school students from Germany participated in this study and were randomly assigned to a feedback condition (n = 60) and a rubric condition (n = 70). After students had written a text, they received a computer based rubric or elaborated feedback and were asked to revise their texts based on that information. Before and after the revision, students self-assessed their performance. Regression analysis indicated that students show higher self-assessment accuracy in the feedback condition compared to the rubrics condition, when controlling for prior self-assessment accuracy. Implications for practice and directions for future research are discussed.

How Learners Self-Assess Using Rubrics and Exemplars: Tracing Cognitive and Affective Processes
Presenting Author: Nathan Rickey, Queen's University, Canada

Cultivating student self-assessment (SA) in K-12 education is critical for fostering learner agency students need to successfully navigate unprecedented societal challenges. However, the cognitive and affective processes of learners using rubrics and exemplars to self-assess are understudied, meaning that supporting learners with developing key SA skills is implausible. The purpose of this paper was to examine the real time cognitive and affective processes of senior secondary school learners using rubrics and exemplars to self-assess their analytical writing. Drawing on a theory of classroom assessment as the co-regulation of learning, I employed a collective case study using digital trace data to infer the ways in which a class of Year 12 students in the UK thought and felt while self-assessing their writing using a rubric and contrasting exemplars on a website. Matomo Analytics, a web analytics platform, collected heatmap and session recording data which elucidated *traces* of each participants' cognitive and affective operations. Participants completed qualitative exit surveys to further characterize their processes. I analyzed trace data using graph theoretic statistics to uncover relational patterns among traced operations. Triangulation of trace data and inductive analysis of keystroke logs and exit surveys revealed that (a) *progress monitoring against standards*, using the rubric and exemplars, was a central initiator of strategies to support revisions, and (b) unpleasant affective states provoked productive progress monitoring using the rubric and exemplars and a shift to positive affective states. Findings offer novel insights into cognitive and affective underpinnings of SA to drive theory and practice.

How do students self-assess? Identifying self-assessment profiles in secondary and higher education
Presenting Author: Leire Pinedo, Universidad de Deusto, Spain; **Co-Author:**Javier Fernández, Universidad de Leon, Spain; **Co-Author:**Ernesto Panadero, Universidad Deusto, Spain; **Co-Author:**Iván Sánchez-Iglesias, Universidad Complutense de Madrid, Spain; **Co-Author:**Daniel Garcia, Universidad Complutense de Madrid, Spain

While self-assessment is a widely explored area in educational research, our understanding of how students generate self-feedback is quite limited. In this study we explored and integrated two data collections (i.e., 67 secondary and 111 higher education) that investigated students' real actions while generating self-feedback. Data was collected using think aloud protocols, direct observation (video recordings) and self-reported data. By combining such data, we explored (1)

what are the different self-assessment profiles, (2) similarities and differences between secondary and higher education students, (3) similarities and differences between writing and mathematics tasks, and (4) the effects of external feedback on self-assessment. We identified six main processes (read, recall, compare, rate, assess, and redo) and four self-assessment profiles (No Self-assessment, Superficial, Intermediate and Advanced self-assessment). Secondary and higher education students showed the same actions and very similar profiles, and external feedback had a negative effect on the self-assessment except for the less advanced self-assessors. Implications for practice as well as promising steps for future research will be addressed.

Session I 7

24 August 2023 12:00 - 13:30
AUTH_T002
Symposium
Motivational, Social and Affective Processes

Motivation-performance connections in writing from elementary to secondary school

Keywords: Attitudes and Beliefs, Goal Orientations, Mindsets, Motivation, Self-efficacy, Writing/Literacy
Interest group: SIG 12 - Writing
Chairperson: Ana Camacho, University of Porto, Portugal
Chairperson: Rui Alexandre Alves, University of Porto, Portugal
Discussant: Michael Hebert, University of California, Irvine, United States

Writing motivation is a key factor in writing performance. Traditionally, the writing research field devoted more attention to cognitive and linguistic processes rather than to motivational factors. Over the past decades, however, theoretical models of writing have increasingly recognized the importance of motivational variables. Consequently, the field has witnessed a growth of studies about writing motivation. Notwithstanding the remarkable growth, there is still room to push this research field forward. In this symposium, we have a twofold aim. First, we will present current research on writing motivation across Europe. Second, we will discuss how teachers can enhance students' writing motivation. Altogether, the papers in this symposium target: (a) both widely studied (e.g., self-efficacy) and understudied motivational constructs (e.g., implicit theories); (b) different school-aged samples (early elementary, middle, and secondary school students); (c) diverse research methods (cross-sectional, longitudinal, and quasi-experimental). Specifically, the first presenter examined the associations between self-efficacy for self-regulation and writing proficiency among early elementary Norwegian students. The second presenter focused on the gender-specific changes in writing achievement goals among Icelandic middle school students, and its role in writing performance. The third presenter tested an intervention aimed at enhancing self-efficacy, implicit theories, and writing performance of Portuguese middle schoolers. Finally, the fourth presenter explored the relations among implicit theories, achievement goals, self-efficacy, writing motives, and writing performance of Flemish secondary school students. These complementary studies will allow us to synthesize research on the motivation-performance connections in writing and discuss directions to further advance the writing motivation research field.

The relationship between self-regulation and writing proficiency
Presenting Author: Gustaf Bernhard Uno Skar, Norwegian University of Science and Technology, Norway; **Co-Author:**Steve Graham, Arizona State University, United States; **Co-Author:**Alan Huebner, University of Notre Dame, United States; **Co-Author:**Arne Johannes Aasen, Norwegian University of Science and Technology, Norway, Norway

The aim of this investigation was to increase knowledge about the associations between self-efficacy and writing proficiency among young students. Participants were 2,054 students enrolled in second grade in Norway in 2021. We measured a specific aspect of self-efficacy, self-regulation (Bruning et al., 2013). Three measures of writing were included: two performance measures (handwriting fluency, and text quality) and one attitude measure. To investigate the extent to which self-regulation could explain variance in the three outcome variables we fitted three regression models. Due to the nested structure of the data, we applied a multilevel modeling (MLM) approach. After controlling for students' language background, age and the school level predictors, self-regulation was found to be a significant predictor for handwriting fluency, text quality, and attitudes to writing. The results confirm earlier research documenting an association between self-efficacy and writing performance, and it does so with a little-researched age group (second graders) in a little-researched context (Norway). The result adds backing to the proposition that it might be worthwhile to help students get more efficacious, and especially experience increases in self-regulation. If students are taught strategies to cope with the writing process, it might have beneficial consequences for their writing development.

Development of writing motivation and its contribution to gender differences in writing performance
Presenting Author: Freyja Birgisdottir, University of Iceland, Iceland; **Co-Author:**Kristján Ketill Stefánsson, University of Iceland School of Education, Iceland

Despite extensive research and governmental initiatives, females continue to outperform their male counterparts in assessments of literacy, often with larger effect sizes for writing than for reading. Although factors that result in literacy achievement are many and varied, motivation is widely considered one of its most important elements. However, few longitudinal studies exist on the development of writing motivation and its contribution to gender differences in writing performance. The current study aimed to explore gender-specific changes in writing motivation across middle school and its role in writing performance. Participants were 400 children (44.75% male) whose writing achievement goals were assessed on a yearly basis across Grades 5 to 7. Specific questions concerned whether the development of such goals would be less adaptive among boys than that of girls, and whether task-, ego-, and work-avoidance goals across Grades 5 to 7 would mediate the effect of gender on writing performance in Grade 7. Results indicated a general decline in writing achievement goals across Grades 5 to 7, except for the work-avoidance subscale, which remained stable over time. Boys exhibited higher levels of work-avoidance goals than girls, while girls scored higher on other goal subscales. Work avoidance negatively predicted writing quality, while other achievement goals were unrelated to writing. Gender had a direct effect on writing quality, as well as a weaker indirect effect via work avoidance. These findings underline the importance of targeting work avoidance in writing, particularly among boys, both for intervention purposes and in further research on writing motivation.

Does adding a mindset intervention to a writing program enhance writing motivation and performance?
Presenting Author: Ana Camacho, University of Porto, Portugal; **Co-Author:**Mariana Silva, Faculdade de Psicologia e de Ciências da Educação da Universidade do Porto, Portugal; **Co-Author:**Joana Cadima, University of Porto, Portugal; **Co-Author:**Nadine Correia, ISCTE - Instituto Universitário de Lisboa, Portugal; **Co-Author:**Paula Cristina Ferreira, Instituto Politécnico de Leiria, Portugal; **Co-Author:**João R. Daniel, ISPA - Instituto Universitário / U.I.P.C.D.E., Portugal; **Co-Author:**Rui Alexandre Alves, University of Porto, Portugal

Self-Regulated Strategy Development (SRSD) is an evidence-based instructional approach combining background knowledge, writing, and self-regulation strategies. While the positive impact of SRSD on writing performance variables is well-established, mixed findings were found for motivational variables. In this study, we examined the impact of an SRSD program on two extensively studied writing performance variables (text quality and text length) and on two motivational variables (self-efficacy and implicit theories). We also tested whether adding a brief growth mindset intervention to SRSD instruction would result in gains in writing motivation and performance. We enrolled 191 sixth graders, from 11 classes, and their Portuguese language teachers to participate in a six-week intervention study. The classes were assigned to one of three conditions: active control condition; SRSD group; and SRSD plus growth mindset intervention group (henceforth, SRSD+GM). Our results showed that the SRSD and the SRSD+GM groups outperformed the active control in text quality and length at posttest. The SRSD and the SRSD+GM groups did not differ from the active control in self-efficacy and implicit theories of writing at posttest, except in self-efficacy for ideation. We did not find an added value of the brief growth mindset intervention. Our study showed that a short SRSD program enhanced students' writing performance and self-efficacy for ideation. However, the brief nature of both SRSD and growth mindset interventions may have precluded a broader positive impact on motivational beliefs.

Relating implicit beliefs, achievement goals, self-efficacy, motives, and writing performance
Presenting Author: Fien De Smedt, Ghent University, Belgium; **Co-Author:**Yana Landrieu, Ghent University, Belgium; **Co-Author:**Bram De Wever, Ghent University, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium

It is well established that students' motivation for writing is a key predictor of their writing performance. The aim of the current study is to study and map the mechanics underlying different motivational constructs (i.e., implicit theories, achievement goals, self-efficacy, and writing motives) and to investigate how these contribute to students' writing performance. For that, 390 Flemish students in the academic track of secondary education completed questionnaires measuring their implicit theories of writing, achievement goals, self-efficacy for writing, and writing motives. Furthermore, they completed an argumentative writing test. Path analysis revealed statistically significant direct paths from (1) entity beliefs about writing to performance avoidance goals (β = .23), (2) mastery goals to self-efficacy for writing ($\beta_{argumentation}$ = .14, $\beta_{regulation}$ = .25, $\beta_{conventions}$ = .18), performance-approach goals to self-efficacy for writing ($\beta_{argumentation}$ = .38, $\beta_{regulation}$ = .21, $\beta_{conventions}$ = .25), and performance-avoidance goals to self-efficacy for writing ($\beta_{argumentation}$ = -.30, $\beta_{regulation}$ = -.24, $\beta_{conventions}$ = -.28), (3) self-efficacy for regulation to both autonomous (β = .20) and controlled motivation (β = -.15), (4) mastery goals to autonomous motivation (β = .58), (5) performance approach and avoidance goals to controlled motivation (β = .18; β = .35), and (6) autonomous motivation to writing performance (β = .11). This study moves the field of writing motivation research forward by studying the contribution of implicit theories, achievement goals, and self-efficacy to students' writing performance, via writing motives.

Session I 8

24 August 2023 12:00 - 13:30
UOM_A03
Symposium

When does feedback unfold its benefits? Insights from studies taking multiple perspectives.

Keywords: Attitudes and Beliefs, Cognitive Skills and Processes, Computer-assisted Learning, Feedback, Instructional Design, Interest, Mathematics/Numeracy, Motivation, Primary Education, Reading, Secondary Education, Self-regulated Learning and Behaviour
Interest group:
Chairperson: Robbert Smit, University of Teacher Education St.Gallen, Switzerland
Discussant: Susanne Narciss, TU Dresden, Germany

Decades of feedback research have revealed that feedback is a core factor for learning and instruction, but if and how feedback is unfolding its effects depends on various factors (see e.g., Hattie & Timperley, 2007; Kluger & DeNisi, 1996; Lipnevich & Panadero, 2022). Based on two recent reviews of 14 prominent feedback frameworks Panadero and Lipnevich (2022) have identified five groups of central factors explaining the large variability of feedback effects on learning outcomes: Message, Implementation, Student, Context, and Agents. The four studies of this symposium provide insights into the role of some of these factors by investigating main and interactive effects of two or more of the factors. In these studies, feedback is provided by two types of agents: computers and teachers. The studies' contexts range from reading comprehension and math to problem solving tasks and writing. Additionally, Swart combines message and implementation characteristics by investigating the effects of elaborateness and timing of feedback on reading comprehension. Smit and colleagues combine message and student characteristics by investigating the effects of teachers' feedback messages on mathematical reasoning for students with differing levels of interest in mathematics. Laudel and colleagues combine implementation and student characteristics by investigating the effect of prompting internal feedback and/or self-compassion on individual differences in the perception of negative feedback and post-feedback learning behavior. Bahr and colleagues combine message and student-agent interaction by investigating the effect of different feedback messages on perceived usefulness and situational interest.

The effect of timing and elaborateness of feedback to support and teach reading comprehension
Presenting Author: Elise Swart, Leiden University, Netherlands

Reading comprehension is essential for success in education. However, the number of children with reading difficulties is high (OECD, 2019). The need for developing knowledge about effective instructional methods to improve reading comprehension is thus undeniable. This concerns instructional methods to support both text comprehension, i.e. learning texts, and to teach students comprehension skills that they can use when reading new texts. Recent literature studies (Author et al., 2019, 2022) have shown that feedback can be an effective method of instruction to support and teach reading comprehension, but that its effectiveness strongly depends on the way in which feedback is designed. The aim of the present study is to systematically investigate the effect of different types of feedback (in terms of timing and elaborateness of the feedback) on reading comprehension. It examines the effectiveness for both supporting the comprehension of a text and for teaching reading comprehension skills that can be used when reading new texts. In an experimental study, the effect of different types of feedback will be investigated in 150 5^{th} grade students, who will be divided into four experimental conditions and two control conditions. The expected results provide guidelines for shaping instruction to prevent and remediate reading comprehension problems.

Hattie & Timperley's feedback levels applied for subject specific content – A math example
Presenting Author: Robbert Smit, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Patricia Bachmann, University of Teacher Education St.Gallen, Switzerland

We present a study that tried to combine feedback elements that were derived from the well-known feedback model of Hattie & Timperley (2007) with feedback that relates to subject specific content. The aim was to explain the impact of feedback for the learning of mathematical reasoning in primary school. It is assumed that reasoning tasks have the potential to trigger students' interest (Sullivan et al., 2012). Feedback needs to be aligned to the learning phase, in the beginning more task feedback is valuable (Hattie & Clarke, 2019). Based on the video-analysis of 44 teachers of 5^{th} and 6^{th} grade primary school classes (N = 804) we examined how feedback on the task level related to two steps (approach and operationalization) of the mathematical reasoning process. In our structural equation model, it further showed that feedback on the task level predicted student achievement in mathematical reasoning via students' interest in mathematics. It might be concluded that the four levels of feedback should be applied by the teacher in such a way that they focus on the current problem that is occurring as the student is solving a task.

How to receive negative feedback well? The effects of internal feedback and self-compassion
Presenting Author: Susanne Narciss, TU Dresden, Germany; **Co-Author:**Helena Laudel, Dresden Technical University, Germany

A new perspective in feedback research focuses on how learners receive and process feedback. The present study adopts this perspective in examining how learners can be supported in receiving negative feedback well. Negative feedback that indicates a discrepancy between the current achievement and the standards can be perceived as self-threatening and hinder learning. Especially learners with low perceived competence often do not benefit from negative feedback. This study aims at investigating the effects of a) a brief internal feedback intervention prior to external negative feedback, and b) a brief self-compassion intervention after receiving negative feedback on feedback perception and post-feedback learning behavior. A sample of N=250 participants is assigned to one of four groups in a 2x2-factorial design. Trait self-compassion and perceived competence are included as moderating factors to account for the relevance of learner characteristics. Data collection is expected to be finished in March 2023. We expect the interventions to support more conducive feedback perception and more adaptive post-feedback learning behavior compared to the control group. Findings will be discussed with regard to their implications for further research as well as their insights on the practical relevance of self-compassion and internal feedback for supporting adaptive coping with negative feedback.

Automated Feedback Effects on Interest Development: Mediated by Feedback's Perceived Usefulness
Presenting Author: Luca Bahr, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**Lars Höft, IPN - Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Thorben Jansen, Leibniz Institute for Science and Mathematics Education, Germany

Developing interest is one of the central goals in K-12 science education. Specific feedback provided by a teacher has been shown to trigger interest via the student perception of feedback usefulness. However, providing specific feedback with a digital agent (i.e., computer) is challenging as algorithm feedback only matches performance in 80% of cases. Thus, we investigated how (mismatched) computer-generated feedback affects feedback working mechanisms in online learning environments. Specifically, we compared the effects of specific feedback, either given algorithm-based to adapt it to performance or at random (less

likely to match performance) with general feedback (matching performance) on changes in situational interest – with a particular focus on the mediating role of feedback's perceived usefulness. 463 secondary school students participated in the experimental study with varied feedback in a between-subject design and three measurement points. Students wrote an argumentative text, received feedback, and revised their texts. Results from path analysis indicated that both specific feedbacks (algorithm-based and random) were perceived as more useful than the general feedback. The working mechanism of computer-generated feedback did not differ from teacher provided feedback since specific feedback (algorithm-based and random) had significant indirect effects on changes in situational interest after feedback and after revision via the perception of feedback usefulness. These preliminary findings suggest that specific feedback comments are better at fostering interest than general comments, despite a potential mismatch with actual performance. At the time of the conference, the observed fit of feedback-student text will have been calculated and practical implications will be discussed.

Session I 9

24 August 2023 12:00 - 13:30
UOM_CR
Symposium
Motivational, Social and Affective Processes

University students' motivation: Recent developments in Expectancy-Value Theory

Keywords: Attitudes and Beliefs, Emotion and Affect, Higher Education, Motivation, Quantitative Methods
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Julia Dietrich, Friedrich-Schiller-University Jena, Germany
Chairperson: Alexander Naumann, Friedrich-Schiller-University Jena, Germany
Discussant: Burkhard Gniewosz, University of Salzburg, Austria

The symposium brings together four papers which each addresses a new aspect to the research on modern Expectancy x Value-Theory (EVT, Eccles & Wigfield, 2020), one of the most influential motivation theories at present. EVT posits that expectancy (can I learn this?) and value beliefs (do I want to learn this?) are central factors influencing outcomes such as effort and persistence, achievement-related choices, and performance. Given the already existing large body of research on EVT, what new can be learnt? For example, the presentations add to recent debates about how the structure of expectancy-value facets can be described and predicted not only on the level of individual students but also on the level of learning situations. The new aspects presented in this symposium concern the methodology to measure expectancy-value beliefs, thus far uncharted or under-researched correlates, and the generalizability of findings. The papers take up recent methodological developments such as network analysis, experience-sampling, and ManyLab data collections. The four papers have in common their research context, namely, university. They also have in common that they use inductive research methods like latent profile or network analysis, which calls not only for replications but also a debate about the conditions under which certain results are found. ReferenceEccles, J. S., & Wigfield, A. (2020). From expectancy-value theory to situated expectancy-value theory: A developmental, social cognitive, and sociocultural perspective on motivation. Contemporary Educational Psychology, 61, 101859.

How can motivational psychology benefit from different approaches to network analysis?
Presenting Author: Julia Dietrich, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Miriam Jähne, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Alexander Naumann, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Julia Moeller, Universität Leipzig, Germany

Academic motivation is central to successful learning of university students. Especially, the dimensionality of Eccles and Wigfield's (2020) expectancy-value theory (EVT) has received closer attention. Nonetheless, EVT has rarely been studied from the psychometric network approach which understands motivational facets in a system of complex, mutual interdependencies. Moreover, there is little guidance on how such network analysis can be used in motivational research. Our paper presents three variants of network analysis (correlative, partial-correlative, co-endorsement) and illustrates how they can be used and interpreted specifically for the study of academic motivation. (Partial)correlative networks examine the (partial)correlations between variables and determine the centrality of the variables within the network. Co-endorsement networks use binary data to show the extent to which two motivational facets are agreed with. 341 first-semester students from different disciplines (biology, nutrition, teaching, medicine, psychology, law, economics) were surveyed cross-sectionally to record how motivating in terms of expectancy, values, and costs the students experienced their first semester. In the analyses, both the correlative and the partial correlative network primarily identified correlation among the task values and among the costs, respectively. In contrast, preliminary results of the co-endorsement network analysis indicated that positive task values and negative costs occur together. All analyses have in common that the intrinsic value is assigned a rather prominent position. Depending on the network analysis method used, it differs which value facets are central within the network or occur particularly frequently together and thus represent possible starting points for interventions and (more individuum-focused) future research.

Stability of Motivational Profiles, the Predictive Role of Perfectionism, and Links to Well-being
Presenting Author: Henriikka Juntunen, University of Helsinki, Finland; **Co-Author:**Heta Tuominen, University of Eastern Finland, Finland; **Co-Author:**Riikka Hirvonen, University of Eastern Finland, Finland; **Co-Author:**Jaana Viljaranta, University of Eastern Finland, Finland; **Co-Author:**Auli Toom, University of Helsinki, Finland; **Co-Author:**Markku Niemivirta, University of Eastern Finland, Finland

Students demonstrate qualitatively diverse motivational profiles that also relate to academic outcomes differently, but little is still known about the stability of the profiles and the possible predictors. In this study, we investigated university students' expectancy-value-cost profiles and their stability over time, the role of perfectionism as a predictor, and profile differences in well-being, within the latent variable modelling framework. Data were collected from Finnish university students (N = 426) over two timepoints during the pandemic. We identified five distinct expectancy-value-cost profiles: positively ambitious (T1 28%, T2 29%), struggling ambitious (T1 22%, T2 19%), moderately motivated (T1 24%, T2 23%), indifferent (T1 18%, T2 22%), and disengaged (T1 7%, T2 7%). Overall, 85% of all students demonstrated a stable profile over a semester, positively ambitious profile showing the highest stability. Perfectionism seemed to be an important predictor of students' likely motivational profiles and some transitions. For example, higher levels of perfectionistic concerns predicted an increased likelihood of membership into the disengaged group and a decreased likelihood into the positively ambitious profiles. Differently motivated students' also differed significantly in the well-being outcomes. Overall, the positively ambitious students displayed the most adaptive well-being and the disengaged students the most maladaptive. The findings offer insights on the associations between general perfectionistic tendencies, expectancy-value-cost motivation regarding studies, and both academic and more general well-being.

Determinants of Motivational Constellations During University Students' Exam Preparation
Presenting Author: Theresa Schnettler, Mannheim University, Germany; **Co-Author:**Brian M. Galla, University of Pittsburgh, United States; **Co-Author:**Anne Scheunemann, Ruhr-University Bochum, Germany; **Co-Author:**Lena Sofie Kegel, Educational Psychology, University of Münster, Germany; **Co-Author:**Stefan Fries, University of Bielefeld, Germany; **Co-Author:**Stefan Janke, University of Mannheim, Germany; **Co-Author:**Carola Grunschel, University of Münster, Germany

Students' motivation is pivotal for effective learning, particularly during performance-critical times such as exam preparation (Capelle et al., 2021). According to Situated Expectancy-Value Theory (SEVT, Eccles & Wigfield, 2020), motivation is situated and comprises expectancies for success, positive and negative value components. Initial studies found that these components fluctuate in varying constellations within students across learning situations during a lecture (Dietrich et al., 2019). SEVT theorizes that gender, temporal proximity of the exam, and task-difficulty are important determinants of situational motivation. In the present study, we investigated intraindividual motivational constellations (profiles) during exam preparation and how gender, temporal proximity, and task difficulty related with the likelihood to experience any of the motivational profiles. A total of 93 undergraduate university students provided data on 645 learning situations in an experience-sampling study during ten days before an exam. Using multilevel latent profile analysis, we identified four profiles of motivational constellations during exam preparation. Two profiles comprised medium and highly motivating situations whereas one profile contained valuable but costly situations, and one profile comprised high-cost situations. The likelihood to experience each of the profiles was unrelated to gender and temporal proximity of the exam. Very low

and very high task difficulty increased the likelihood to experience valuable but costly situations and high-cost situations, whereas the other two profiles co-occurred with moderate task difficulty. Our study advances the theoretical understanding how motivational components combine in performance-critical situations and how task difficulty impacts learning motivation. We further conclude to develop context-sensitive motivational interventions.

Generalizability of situated expectancy-value findings: Invitation to a ManyMoments data collection
Presenting Author: Jessica Baars, Leipzig University, Germany; **Co-Author:**Lennart Nörenberg, Universität Leipzig, Germany; **Co-Author:**Julia Moeller, Universität Leipzig, Germany

Intensive longitudinal studies investigate phenomena that change over time, people, and contexts. The experience sampling method (ESM) gathers fluctuating psychological states. When examining motivation and emotions with ESM, challenges to the generalizability and replicability arise (Table 1). In addition to general challenges depicted in Table 1, there are further reasons to systematically compare findings of situational academic motivation and emotions across contexts. For instance, first empirical studies on situated expectancy-value experiences (Dietrich et al., 2017; 2019; Moeller et al., 2020; 2022) relied on pilot data from one university lecture only and therefore need to be replicated and tested for generalizability across contexts. To prepare such a systematic replication, we invite the audience to join a multi-lab study of situated expectancy-value measures across university lectures, forming part of the ManyMoments Project.
This multi-lab project aims to investigate assumptions central to the situated expectancy-value theory (Eccles & Wigfield, 2020) and the DYNAMICS framework (Figure 1; Moeller et al., 2022). It will examine the short-term development of situational expectancy-value experiences, as well as heterogeneity versus generalizability across individuals, time points, and contexts.
The presentation presents the research design that will be used in the ManyMoments project. We hope to start a debate about needs and solutions for replicable ESM research on academic emotions and motivation and to invite the audience to join the ManyMoments project for a joint data collection of situated expectancy-value experiences in university classes.

Session I 10

24 August 2023 12:00 - 13:30
AUTH_DC2
Single Paper
Learning and Instructional Technology, Learning and Special Education

Supporting Student's Writing and Literacy

Keywords: Argumentation, Digital Literacy and Learning, Engagement, Feedback, Foreign and Second Language Acquisition, Inclusive Education, Knowledge Construction, L1/Standard Language Acquisition, Meta-analysis, Mixed-method Research, Peer Interaction, Primary Education, Quantitative Methods, Secondary Education, Teaching/Instructional Strategies, Writing/Literacy
Interest group: SIG 12 - Writing
Chairperson: Jannika Haase, Leibniz University Hannover, Germany

Effective language programs for students who need extra language support: A systematic meta-review
Keywords: Foreign and Second Language Acquisition, L1/Standard Language Acquisition, Meta-analysis, Writing/Literacy
Presenting Author: Jordi Casteleyn, Antwerp University, Belgium; **Co-Author:**Mathea Simons, University of Antwerp, Belgium; **Co-Author:**Tom Smits, Antwerp University, Belgium

There is a clear need for language programs catering for students with insufficient command of the instruction language. But what are the features of effective language programs? To find the answer, we adopted the procedure of an umbrella review, which only uses systematic reviews, with or without a meta-analysis, and thus does not include primary studies. We identified studies (N=952) based on relevant keywords, after which publications were excluded based on title, abstract (n=727) and full text (n=184). In the second phase, we assessed methodological quality, resulting in an additional 8 studies being excluded. Eventually, these studies (n=33) were simultaneously analyzed by several researchers to ensure the validity of the project results. We ultimately identified six ‘building blocks’ that are essential in developing an effective language program: the first being education as a multi-tiered approach, the second the step-by-step development of skills, the third focusing on the oral skills, the fourth building block a focus on literacy skills, the fifth being high-quality instruction and finally, as the sixth corner stone, monitoring student progress. In this session, we will further describe the results of the project and define how these building blocks will help colleagues who experience similar challenges.

Enhancing genre knowledge of argumentative texts through learning from comPA(I)Ring exemplars
Keywords: Argumentation, Knowledge Construction, Secondary Education, Writing/Literacy
Presenting Author: Tine Mombaers, University of Antwerp, Belgium; **Co-Author:**Roos Van Gasse, University of Antwerp, Belgium; **Co-Author:**Sven De Maeyer, Antwerp University, Belgium

Poor writing skills are problematic in today’s society where writing expertise is essential in personal, academic and professional contexts. Students struggle most with argumentative writing. To write a good argumentative text, students need genre knowledge on this type of text. After all, genre knowledge has been proven to be related to writing quality. Despite its relevance, existing literature does not describe how to best enhance genre knowledge. Learning from (comparing) text exemplars might be the missing link. This study aims to investigate whether learning from (comparing) text exemplars can enhance genre knowledge. A quasi-experimental study with 77 11^{th} grade students was carried out to test the effects of four conditions on genre knowledge of argumentative texts. Findings show that looking for differences seems less effective than searching for similarities. In addition, learning from comparing text exemplars does not increase genre knowledge more than learning from singe, sequential exemplars.

Development of student feedback literacy through peer feedback in an online cross-cultural setting
Keywords: Engagement, Feedback, Peer Interaction, Writing/Literacy
Presenting Author: Qiyun Zhu, Guangdong University of Foreign Studies, China

Peer feedback conceptualized as a collaborative peer dialogue is considered an effective way to develop student feedback literacy (SFL) which refers to students’ capacities and dispositions to use feedback. However, dialogic peer feedback is particularly challenging for second language (L2) learners due to cultural and linguistic concerns. This study situated in a writing curriculum for L2 learners in a Chinese university aims to understand the development of SFL through dialogic peer feedback in online cross-cultural settings. 23 Chinese participated in a one-month peer feedback with their American counterparts. Data were mainly derived from reflective journals and interviews with the Chinese students. The data were thematically analyzed. The students were found to engage behaviorally, cognitively and affectively. Also, the study reveals task design and teacher scaffolding as two major facilitative contextual factors. The design of the task included asynchronous written peer feedback, prior peer feedback among Chinese students, and the writing task of film review. Teacher scaffolding involved teacher guidance in communication strategies such as being proactive and asking questions related to sociocultural issues, and teacher feedback in a wrap-up seminar addressing the students’ writing skills, socio-cultural issues and proactivity in peer feedback. The study questions the cultural appropriateness of peer feedback whilst accentuating the role of task design and teacher support in addressing culturally-rooted concerns and fostering the development of SFL. The study carries important pedagogical implications for peer feedback in the post-COVID-19 era where virtual student mobility is increasing.

Student and Classroom-Level Predictors of Keyboard-Based Writing in Early Primary
Keywords: Digital Literacy and Learning, Primary Education, Teaching/Instructional Strategies, Writing/Literacy
Presenting Author: Anabela Malpique, Edith Cowan University, Australia, Australia; **Co-Author:**Debora Valcan, Murdoch University, Australia; **Co-Author:**Deborah Pino-Pasternak, University of Canberra, Australia; **Co-Author:**Susan Ledger, The University of Newcastle, Australia; **Co-Author:**Mustafa Asil, University of Otago, New Zealand; **Co-Author:**Timothy Teo, The Chinese University of Hong Kong, Hong Kong

In today's fast paced digital world, keyboard-based writing has become a key component in daily communication activities and professional working. Nonetheless, there's a lack of systematic studies investigating keyboarding and its relationship with written products. The current study had two primary aims: 1) to examine unique student-level predictors of keyboard-based writing for Year 2 children, which included keyboarding automaticity, literacy skills (e.g., reading and spelling), executive functioning, writing attitudes, and gender; 2) to examine classroom-level factors predicting keyboard-based writing in Year 2, such as teachers' preparation and instructional practices for writing. The current study involved 544 Year 2 students enrolled in 47 classrooms from 17 primary schools in Western Australia. Student and classroom-level factors were evaluated using multilevel-modelling analyses. Results revealed that keyboarding automaticity, spelling, word reading, reading comprehension, general attitudes toward writing, and gender were uniquely related to keyboard-based compositional quality. Keyboarding automaticity, word reading, and gender were also uniquely related to keyboard-based compositional fluency. Results also showed that female students outperformed their male peers in keyboarding automaticity, compositional quality and fluency, but also on attitudes toward writing and reading comprehension. For classroom-level factors, findings showed time teaching keyboarding and revision strategies positively related to compositional fluency. Time teaching handwriting was negatively related to compositional quality. The novel findings from this study suggest that, to support Year 2 students' keyboard-based writing, attention must be placed on multiple components predicting students' writing performance, including writing and reading skills, motivational factors, and gender, as well as instructional practices promoting effective writing.

Analyzing the Writing Processes in the Project Fair Debating and Written Argumentation in Grade Nine
Keywords: Inclusive Education, Mixed-method Research, Quantitative Methods, Writing/Literacy
Presenting Author: Winnie-Karen Giera, Institute of German Studies, University of Potsdam, Germany; **Presenting Author:**Lucas Deutzmann, University of Potsdam, Germany; **Co-Author:**Sarah Risse, Institute of German Studies, University of Potsdam, Germany

The teaching and research project Fair Debating and Written Argumentation is a controlled, quasi-experimental intervention study in panel design in grade 9 at schools with higher education and non-higher education track with 355 students. In this context the central question is, how (written) language competences of ninth-grade students can be assessed and developed by two series of lessons on the topics of debating and argumentative writing. The study examines the mutual influence between debating competence (treatment D) and writing competence (treatment E). The lesson series were conducted by the team of the chair and include debating (inspired by *Jugend debattiert*) and argumentative writing (in the sense of SRSD, Graham & Harris, 2017). The measurement of writing competence was realised in a mixed methods design by four writing tasks (argumentative writing) from selected intermediate secondary school exams of the past ten years. All anonymised written argumentations (n =1,000) were holistically and analytically rated within a double-blind review process on Likert scale quantitatively (Cohen's Kappa =.828). The presentation focuses on the results of the intervention study about the text length, the text quality (overall impression), and selected data of digitally recorded writing processes. The results show for example, regarding the order of the treatments, that the texts of those students, who debated first and then composed written argumentations, had a greater text length and quality than in the other intervention group and the control group (also in the non-higher education track).

Session I 11

24 August 2023 12:00 - 13:30
UOM_R09
Single Paper
Lifelong Learning

Informal Learning in Professional Settings

Keywords: Communities of Learners and/or Practice, Cooperative/Collaborative Learning, Immersive Technologies for Learning, Informal Learning, Knowledge Construction, Lifelong Learning, Problem-based Learning, Qualitative Methods
Interest group: SIG 14 - Learning and Professional Development, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Attila Rausch, Hungary

Learning in Design Work: Developing Patient Information Systems through Object Construction
Keywords: Communities of Learners and/or Practice, Informal Learning, Lifelong Learning, Qualitative Methods
Presenting Author: Christopher Sadorge, University of Oslo, Faculty of Education, Norway; **Co-Author:**Monika Nerland, University of Oslo, Norway

Learning at work emerges through the active participation of practitioners in dynamic work settings (Billett, 2021) and is closely related to the tasks that professionals perform. One of the expanding tasks that professionals face when political and organizational ambitions move from stand-alone technologies to fostering digital transformation (Wessel et al., 2021) is design work. This study explores how health professionals take part in designing technologies to support care pathways, and how tensions between multiple locations and contexts are negotiated in efforts to align and standardise practices to a shared interface of patient information from other time and places. We followed design meetings over two years with a team of health professionals and software developers mandated to develop a system for the registration and sharing of patient information across healthcare units. Data from the meeting observations were analysed to explore how the design team constructed and explored a series of intermediary objects through which problems of information sharing between health units were framed and explored and generated new questions that needed to be resolved. This oscillation between exploring the intermediary objects at hand and stabilising them provides important learning opportunities at work.

Use and appropriation of digital technologies in an informal work context
Keywords: Communities of Learners and/or Practice, Cooperative/Collaborative Learning, Immersive Technologies for Learning, Informal Learning
Presenting Author: Valérie Payen Jean Baptiste, University of Geneva, Switzerland

This contribution presents the epistemological foundations underlying an ethnographic research conducted on the processes of use and appropriation of digital technologies in an informal work context, mainly, in sales and repair communities in [anonymized].Based on a theoretical mixed, articulating Rabardel's instrumental theory (1995, 2014), the theory of communities of practice (LAVE, 1991; Wenger, 2009) and the theory of skills enactment (le Boterf, 2001, 2018; Masciotra, 2017; Masciotra et al., 2018) the research explored the modalities of knowledge and skills acquisition of actors of the informal sales and repair communities through their uses of digital technologies in the context of their professional activities. The results show the interdependence between the activities mediated by digital technologies and the socio-economic context in which they are situated.

Uncertainty as a driver for informal learning in crowdwork practices
Keywords: Informal Learning, Knowledge Construction, Problem-based Learning, Qualitative Methods
Presenting Author: Karen Schwien, Helmut Schmidt University, Germany; **Co-Author:**Tim Thrun, Helmut-Schmidt-Universität Hamburg, Germany; **Co-Author:**Tobias Schlömer, Helmut-Schmidt-University/University of the Federal Armed Forces Hamburg, Germany

How can workers learn to deal with uncertainty, a vital skill in the new world of work? Crowdwork, which describes platform-mediated online tasks offered by clients to mostly self-employed crowdworkers, could offer an informal learning opportunity for learning those skills in work practices. It is characterized by various kinds of uncertainty. In our study we examine uncertain situations in crowdwork from the perspective of the crowdworkers, their practices to deal with these situations and how they develop those practices in the course of their work. Therefore, we conducted 17 narrative interviews in November 2021. Data was analysed based on theoretical coding. Especially situations of epistemic uncertainty could be derived mainly due to the digitally mediated environment, lack of information provided by the platform and lack of professional testing and crowdwork capabilities of the crowdworkers. In their pursuit to decrease uncertainty crowdworkers self-directedly develop those skills, they also perform a high amount of interpretation work trying to close information gaps. Educational measures integrated in crowdwork settings could help prevent misinterpretations and feelings of insecurity especially for beginners. Crowdwork can also serve as a real-life example for future digital work which can be used in formal education.

Session I 12

24 August 2023 12:00 - 13:30
AUTH_T202
Single Paper
Instructional Design, Learning and Instructional Technology, Learning and Social Interaction

Inquiry Learning in Science Education

Keywords: Early Childhood Education, Educational Technologies, Inquiry Learning, Instructional Design, Mixed-method Research, Qualitative Methods, Science and STEM, Science Education, Secondary Education, Teaching/Instructional Strategies
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Ayafumi Goto, Japan

How Do Preschool Teachers Foster Children's Understanding of Scientific Inquiry?
Keywords: Early Childhood Education, Qualitative Methods, Science and STEM, Science Education
Presenting Author: Ada Haen, University of Hamburg, Germany; **Co-Author:**Mirjam Steffensky, University of Hamburg, Germany; **Co-Author:**Ilonca Hardy, Goethe-Universität Frankfurt, Germany; **Co-Author:**Miriam Leuchter, RPTU Landau, Germany; **Co-Author:**Henrik Saalbach, University of Leipzig, Germany; **Co-Author:**Anika Bürgermeister, University of Leipzig, Germany; **Co-Author:**Katharina Junge, University of Hamburg, Germany; **Co-Author:**Laura Venitz, University of Koblenz-Landau, Germany

In order to participate in modern society, knowledge of scientific concepts as well as an understanding of scientific inquiry is essential. Children develop initial knowledge and skills about scientific inquiry, such as identifying patterns, long before entering school. It can be assumed that explicit and stimulating instruction of scientific inquiry fosters this development. This study explores which inquiry activities are implemented in science learning environments in preschool and if these activities are explicitly combined in terms of an inquiry cycle. Further, we examine the quality of instructional support preschool children receive to understand scientific inquiry. Therefore, we analyzed 49 videos of learning environments in which preschool teachers interact with 4-6 children on the topic of materials (e.g., wood, plastic, or metal). We observed the implementation of selected inquiry activities using a dichotomous scheme and rated the instructional quality. The results show that in most learning environments, children had multiple opportunities to conduct inquiry activities (e.g., observing, predicting). Often, these activities were combined in a (simple) inquiry cycle such as predict – test - interpret. At the same time, the instructional quality of the learning environments was rather low based on the conducted analysis. Almost all preschool teachers in this sample implement inquiry activities. However, stimulating interactions about scientific inquiry are rare, suggesting that children's understanding of inquiry – an essential component of scientific literacy - is not sufficiently fostered in the analyzed videos.

How Does Critiquing Peer Ideas Help Students Revise Their Science Explanations?
Keywords: Inquiry Learning, Instructional Design, Mixed-method Research, Science Education
Presenting Author: Katharina M. Bach, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Sarah Bichler, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Marcia Linn, University of California-Berkeley, United States

Revising science explanations allows learners to develop a coherent understanding of scientific phenomena by integrating different ideas, a key learning outcome according to the Knowledge Integration (KI) Framework (Linn & Eylon, 2011). We explore the design of critique activities and analyze how peer critique helps 1305 middle school students to revise science explanations. We compare three alternative designs that differ in the characteristics of the peer ideas the student is asked to critique. Specifically, students critiqued a peer's explanation about thermodynamics that describes observations (intuitive); combines intuitive and normative ideas (partial); or connects a claim with scientific evidence (linked). Students wrote and revised their explanation and critiqued their peer's ideas in an online learning environment with random assignment to the critique conditions. Initial and revised explanations were scored using a KI rubric that rewarded linking claims and evidence. Overall, students improved from initial to revised explanation. Students in the linked condition received the highest KI scores. Additionally, in all conditions, students who started with a higher KI score had an advantage over students who started with a lower KI score. This difference was strongest in the intuitive condition. Qualitative analyses indicated that many students copied ideas from the example, regardless of their correctness. This might explain why students in the linked condition performed better in the revision than those in the partial or intuitive conditions. We suggest that a more effective critique activity is to compare two explanations and offer more guidance for students (e.g., evaluation criteria or reflection prompts).

Inquiry learning in science education with combined real and virtual experiments
Keywords: Educational Technologies, Inquiry Learning, Science Education, Secondary Education
Presenting Author: Salome Flegr, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Jochen Kuhn, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Katharina Scheiter, University of Potsdam, Germany

One fundamental aim of science education is fostering students' conceptual understanding. The instructional approach of inquiry learning has proven to be one possibility to effectively foster this understanding of concepts. Inquiry learning has traditionally always been implemented with real, hands-on experiments. Nowadays, digital technologies also allow for the implementation of virtual experiments (interactive simulations). Recent research suggests that combinations of real and virtual experiments are more effective for improving students' conceptual understanding than single experimentation formats alone. However, more research is needed in this behalf concerning different learning topics and age groups than in the previous studies. Moreover, the role of sequencing these experimentation formats is yet unclear. In the present study, 186 middle school students were involved in inquiry learning in a physics lesson. They worked either with a combination of real and virtual experiments in two different sequences or with the real, hands-on experiment only. In line with our hypotheses, inquiry learning fostered students' conceptual understanding in physics and students in the combination conditions learned more than students in the single experiment condition. The superiority of learning with combined real and virtual experiments can be explained by the complementary advantages offered by the different experimentation formats. Moreover, we investigated whether one sequence of experiments might be better to the other, but both combinations were equally effective for fostering students' conceptual understanding. In conclusion, this study suggests that combinations of real and virtual experiments can be recommended for inquiry learning in science education regardless of their sequence.

Strengthening Creative Problem Solving in Elementary Science Education.
Keywords: Inquiry Learning, Qualitative Methods, Science Education, Teaching/Instructional Strategies
Presenting Author: Ard Lazonder, Radboud University, Netherlands; **Co-Author:**Robin Willemsen, Radboud University, Netherlands; **Co-Author:**Evelyn Kroesbergen, Radboud University, Netherlands; **Co-Author:**Isabelle de Vink, Radboud University, Netherlands

While educational experts stress the importance of creative problem solving (CPS), elementary school teachers struggle to incorporate this way of thinking into their classrooms. The science curriculum could provide room for CPS, since CPS is an integral aspect of scientific inquiry. Unfortunately, studies investigating the possibilities to strengthen CPS within scientific education seem limited in number. In this intervention study, we examined the effectiveness of a lesson series for fourth-to-sixth graders (N = 241). All classrooms received five scientific inquiry lessons, in which ample room was provided for creative modes of thought (specifically, divergent and convergent thinking). Although the structure for each lesson was the same across all classes, two conditions were created based on the creativity instruction given to pupils. In the intervention condition the processes of divergent and convergent thinking were introduced, explained and exemplified prior to practice, whereas the control condition entailed no creativity-specific instructions. Herewith, we could assess whether and to what degree we can strengthen creative problem-solving skills within primary school's science education. Divergent and convergent thinking were assessed through pre- and posttests and by assessing the lessons' worksheets. Preliminary analyses show an overall increase in convergent thinking, but no improvement in terms of divergent thinking. Additionally, no differences were found between conditions. These results show that ways to strengthen creativity within the science curriculum might not be as straightforward as theories suggest.

Session I 13

24 August 2023 12:00 - 13:30
AUTH_TE2
Single Paper
Assessment and Evaluation, Learning and Special Education, Teaching and Teacher Education

Teacher Training for Inclusive Education

Keywords: Achievement, Attitudes and Beliefs, Classroom Assessment, Cultural Diversity in School, In-service Teachers, Inclusive Education, Meta-analysis, Pre-service Teachers, Quantitative Methods, Social Sciences and Humanities, Teacher Professional Development, Tool Development
Interest group: SIG 01 - Assessment and Evaluation, SIG 11 - Teaching and Teacher Education, SIG 15 - Special Educational Needs
Chairperson: Iro Xenidou-Dervou, Loughborough University, United Kingdom

Does teacher training support implementing inclusive education? - A systematic meta-analysis
Keywords: In-service Teachers, Inclusive Education, Meta-analysis, Teacher Professional Development
Presenting Author: Elisabeth Graf, University of Vienna, Austria; **Co-Author:**Johanna Donath, University of Vienna, Austria; **Co-Author:**Timo Lüke, University of Graz, Austria; **Co-Author:**Thomas Götz, Developmental and Educational Psychology, Austria

Inclusive education is a teaching approach aimed at educating all students in general classrooms independent of diversity features such as special educational needs, giftedness, or migration. To successfully implement inclusive education, teachers need to be equipped with positive beliefs towards inclusive education, knowledge about the diverse needs of their students, and skills to address these needs. Usually, teachers are supported through professional development opportunities, where teachers come together to receive training but are left alone with the implementation. Are these professional development opportunities effective in supporting teachers to develop the necessary knowledge, beliefs, and skills, and are these trainings effective in improving student behavior in schools (e.g., on-task behavior, school achievement)? We conducted a systematic review and meta-analysis to address these questions. The screening of the 12,050 search results revealed 342 eligible studies that provided a sum of 1,123 effect sizes. We observed significant positive effects on all outcome categories in varying degrees. We analyzed design aspects of teacher training that might explain differences in the strength of training effects and discussed implications for future research and teacher training.

Content and duration of inclusive training: systematic review and analysis of teachers' discourse
Keywords: Attitudes and Beliefs, Inclusive Education, Pre-service Teachers, Teacher Professional Development
Presenting Author: Kamilla Khamzina, Université de Lille, France; **Co-Author:**Arnaud STANCZAK, Université Blaise Pascal - Clermont-Ferrand II, France; **Co-Author:**Celenie Brasselet, Université de Lille, France; **Co-Author:**Federica Cilia, Université de Picardie Jules Verne, France; **Co-Author:**Nicolas Guirimand, Université de Rouen Normandie, France; **Co-Author:**Sandrine Rossi, Université de Caen, France; **Co-Author:**Camille Legrain, Université de Lille, France; **Co-Author:**Caroline Desombre, Université de Lille, France

Teachers' inclusive attitudes are one of the most important factors to promote a fully inclusive society. In turns, they are shown to be influenced by various factors such as teachers' self-efficacy or students' type of learning difficulty. Inclusive education training has also an impact on teachers' inclusive attitudes and behaviors. However, while the literature consistently shows such a positive effect, there is little evidence on the optimal duration and content to consider when designing such trainings. To address this question, we conducted (1) a systematic review of literature to examine the effects of content and duration of the trainings and (2) a set of semi-directive interviews among general teachers of the French northern region (both studies are pre-registered). The systematic review on 36 interventions showed the overall positive effect of both stand-alone and infused trainings as well as information based cognitive and mixed ones. Moreover, twenty-four semi directive interviews by using a thematic discourse analysis revealed that supplemental needs such as a need of interprofessional collaboration with other social and medical professionals (e.g., special educators, speech therapists, etc.) should be emphasized in an educational teacher training. Such findings allow to inform educational policy makers when it comes to conceive a successful training to be further implemented in the university curricula to promote a fully inclusive school setting.

Validation of a French scale to assess educators' attitudes toward inclusive education
Keywords: Attitudes and Beliefs, Inclusive Education, Social Sciences and Humanities, Tool Development
Presenting Author: Camille Legrain, Université de Lille, France; **Co-Author:**Célénie Brasselet, Université de Lille, France; **Co-Author:**Kamilla Khamzina, Université de Lille, France; **Co-Author:**Mickaël Jury, Clermont Auvergne University, France; **Co-Author:**Caroline Desombre, Université de Lille, France

Inclusive education is a major concern for education systems around the world and the French one in particular. However, its implementation faces many difficulties. Among the leverages and barriers to this implementation, the attitudes toward inclusive education were particularly studied. In the present research, two studies to develop and validate a scale to assess the teachers' and para-professionals' attitudes from French-speaking countries were conducted. An in-depth study of the literature and pre-existing scales available in English allowed the construction of a 19-item scale in French. In Study 1, 177 in-service and pre-service teachers and para-professionals completed this new scale. Exploratory factor analyses allowed to identify two factors and led us to remove three items. The first factor represents items that relate to the impact of inclusive education on instruction, while the second factor represents items related to the impact of inclusion on all students. In Study 2, 228 participants (teachers and para-professionals) completed the 16-item revised scale. Statistical analyses revealed satisfactory psychometric qualities such as the bi-dimensional structure, a good internal consistency (ω=.92) and a satisfactory convergent validity. Altogether these results confirm that this new scale is satisfactory and, by allowing to measure attitudes of both teachers and para-professionals in French-speaking countries, could contribute to overcome the recent interdisciplinary challenges of inclusive education.

Measurement of Multidimensional Classroom Composition Using The Concept of Hypervolumes
Keywords: Achievement, Classroom Assessment, Cultural Diversity in School, Quantitative Methods
Presenting Author: Merle-Sophie Thielmann, University of Mannheim, Germany; **Co-Author:**Karina Karst, University of Mannheim, Germany

The present study proposes a new measure of classroom composition, which allows the integration of diversity on several social dimensions into a single index. Classroom composition can thus be characterized in a more complex way, which is especially promising from an intersectional viewpoint. We adapt the hypervolume concept from ecological trait modeling, which represents students as points within a multidimensional trait space spanned by the composition variables of interest, and classrooms as so-called hypervolumes which describe the space covered by these points (Blonder et al., 2018). Hypervolumes can be characterized through their volume and average distance of students from the hypervolume centroid (dispersion).Using data from 62 fifth-grade classrooms in Germany, we investigate the relationship of hypervolume indices and single-dimension measures of classroom composition. Additionally, hypervolume indices are tested as predictors of individual student achievement in multilevel models. We find significant correlations (r = 0.20 – 0.61) between volume and dispersion of hypervolumes and range and standard deviation on single dimensions. Hypervolume indices do not significantly predict individual student achievement. Our correlative results indicate the concurrent validity of hypervolume measures. Further investigation of their predictive validity is needed and might be obtained by using larger datasets.

Session I 14

24 August 2023 12:00 - 13:30
AUTH_T102
Single Paper
Educational Policy and Systems, Learning and Social Interaction, Teaching and Teacher Education

Sustainable Development and Climate Change

Keywords: Assessment Methods, Citizenship Education, Cooperative/Collaborative Learning, Critical Thinking, Curriculum Development, Science and STEM, Science Education, Social Interaction, Sustainable Development, Teacher Professional Development

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 13 - Moral and Democratic Education, SIG 14 - Learning and Professional Development
Chairperson: Natalie de Nóbrega dos Santos, ISPA-Instituto Universitário, Portugal

The (Un)political Perspective on Climate Change in Education—A Systematic Review
Keywords: Citizenship Education, Curriculum Development, Science and STEM, Sustainable Development
Presenting Author: Martin Schwichow, University of Education Freiburg, Germany; **Co-Author:**Johanna Kranz, Center of Excellence for Climate Change Impacts, Research Institute of Forest Ecology and Forestry Rhineland-Palatinate, Germany; **Co-Author:**Petra Breitenmoser, Zurich University of Teacher Education & University of Zurich, Switzerland; **Co-Author:**Kai Niebert, Institute of Education, University of Zurich, Switzerland

Mitigating and adapting to climate change requires foundational changes in societies, politics, and economies. Greater effectiveness has been attributed to actions in the public sphere than to the actions of individuals. However, little is known about how climate literacy programs address the political aspects of mitigation and adaptation. The aim of this systematic literature review is to fill this gap and analyse how public-sphere actions on mitigation and adaptation are discussed in climate literacy programs in schools. Based on database searches following PRISMA guidelines we identified 75 empirical studies that met our inclusion criteria. We found that central aspects of climate policy such as the 1.5-degree limit, the IPCC reports, or climate justice are rarely addressed. Whilst responsibility for emissions is attributed to the public sphere, the debate about mitigation usually focuses on the private sphere. Climate change education does not, therefore, correspond to the climate research discourse. We show that effective mitigation and adaptation are based on public-sphere actions and thus conclude that effective climate education should discuss those public actions if it is to be effective. Hence, we propose that climate education should incorporate political literacy to educate climate-literate citizens.

Using Data to inform Classroom Practice for Climate Change Education
Keywords: Assessment Methods, Curriculum Development, Sustainable Development, Teacher Professional Development
Presenting Author: Paul Howard-Jones, University of Bristol, United Kingdom; **Co-Author:**Nicola Warren-Lee, University of Bristol, United Kingdom; **Co-Author:**Chris Aldred, Sidcot School, Winscombe, United Kingdom

We report on the implementation by teachers of a brief survey evaluating a science program on Climate Change and how the data arising was used to inform its development. Unlike most areas of education, the learning objectives of climate change are intended to include development of attitudes and behaviour, which are outcomes requiring different approaches their evaluation compared with knowledge and understanding. The survey supported evaluation of the programme (N=62, 11-14 years) in terms of student belief, self-efficacy, action, intended action, and anxiety related to climate change. Only self-efficacy was found to benefit, suggesting students were more confident in their abilities to act but had not developed in their intentions to do so. Subsequent discussion focused on the emotional and motivational content of the programme, prompting several novel modifications. Results are discussed in terms of the potential of the survey to support reflective practice and development of pedagogy in this important and challenging area.

Scientific literacy, agency and the future: students' images of sociotechnical change
Keywords: Critical Thinking, Science and STEM, Science Education, Sustainable Development
Presenting Author: Tapio Rasa, University of Helsinki, Finland; **Co-Author:**Jari Lavonen, University of Helsinki, Finland; **Co-Author:**Antti Laherto, University of Helsinki, Finland

The goal of formal education is, in a sense, to prepare young people for the future. Meanwhile, images of the future tend to be somewhat dominated by expectations, hopes and fears regarding scientific and technological advancements and their various impacts on societies and human life in general. Interestingly, while various trends in education highlight the importance of pedagogies that address societal and environmental questions and promoting students' agency, research has only recently been exploring how to inform the development of "future-oriented science education". To inform the construction of a comprehensive framework to this end, the research outlined here explored the connections between students' scientific literacy and their futures thinking, especially focusing on the agency-oriented "Vision III" perspective on scientific literacy. To root the argument in students' thinking, we set out to address this issue by investigating 58 secondary school students' essays describing their image of the future. Qualitative content analysis showed that students' images of the future feature technological changes ranging from improved everyday devices to large-scale technologization, thus spanning discussions of incremental and radically transformative sociotechnical change and nonproblematic and complexly value-laden issues. Importantly for agency-oriented scientific literacy, students' socioscientific thinking around agency over such change was mostly vague, even if some students constructed detailed narratives about expert and nonexpert roles in deep socioscientific discourse. We conclude by discussing the implications for the development of future-oriented science education.

Students' meaningmaking processes in a school project about sustainable development
Keywords: Cooperative/Collaborative Learning, Critical Thinking, Social Interaction, Sustainable Development
Presenting Author: Anniken Furberg, University of Oslo, Norway; **Presenting Author:**Kenneth Silseth, University of Oslo, Norway; **Co-Author:**Marthe Wiseth Fundingsrud, Department of Teacher Education and School Research, University of Oslo, Norway

This paper reports on a study of how students' experiences from their everyday lives can become resources in school projects about sustainable eating habits and food production. The data were produced during a school project about sustainable development in an upper secondary school in Norway. The project took place during 12 school lessons distributed over a period of three weeks. By taking a sociocultural and interactional approach on learning and instruction, this article provides insight into how student resources - experiences, ideas, and assumptions from their everyday lives, are made sense of and applied in the ongoing interactional work carried out by students and their teachers. Microanalyses of classroom interactions display that the student resources became mediational means in the sense of enabling students to formulate and provide complex reasoning about sustainable eating habits and food production, as well as providing the teachers insights into students' conceptual understandings and challenges. However, what proved to be more demanding for both students and teachers was to contextualize the personal and local initiatives and challenges related to eating habits and food production in a global perspective. The findings are discussed according to possible implications for instruction.

Session I 15

24 August 2023 12:00 - 13:30
UOM_A11
Single Paper
Learning and Social Interaction, Motivational, Social and Affective Processes

Social Aspects of Learning in the Classroom

Keywords: Communication Skills, Cooperative/Collaborative Learning, Developmental Processes, Dialogic Pedagogy, Engagement, In-service Teachers, Motivation, Peer Interaction, Primary Education, Qualitative Methods, Social Aspects of Learning and Teaching, Social Interaction
Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 13 - Moral and Democratic Education, SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Stephanie Pieschl, Technical University of Darmstadt, Germany

Engagement as an emergent, collective process: A review of the literature
Keywords: Engagement, Peer Interaction, Social Aspects of Learning and Teaching, Social Interaction
Presenting Author: Mayra Mascareño Lara, University of Groningen, Netherlands; **Co-Author:**Elisa Kupers, University of Groningen, Netherlands; **Co-Author:**Naomi de Ruiter, University of Groningen, Netherlands; **Co-Author:**Fenna Wolthuis, University of Groningen, Netherlands

Engagement is one of the most important conditions for learning, and it is typically understood as a multidimensional, individual construct. New conceptualizations of engagement expand the concept, claiming that engagement is also an emergent, collective process. We reviewed the empirical literature

on engagement to examine a) how engagement as a collective process is defined and operationalized; b) what are the mechanisms for its emergence; and c) what is the role of the teacher in its emergence anf management. The majority of included studies inferred engagement as an individual construct influenced by the context. However, we also identified studies that a) inferred engagement at the level of collectives; b) proposed a the dual/dialectic individual and collective character of engagement; or c) inferred group engagement by aggregating individual measures. For collective engagement to happen individuals need to be able to meaningfully engage with a task, express their engagement—discursively and bodily—and participate in a coordinated, self-sustaining process of sense-making at the group level. Teachers need to skillfully read the ebb and flow of group interaction, in order to properly time their interventions and monitor a balanced distribution of autonomy in the group activity. Their role is crucial in proposing educational approaches that favor group discussions, collaboration and discovery, and in securing that these take place in a climate of social-emotional cohesion.

Evidence for Reciprocal Effects in the Classroom: An Explorative Approach
Keywords: Developmental Processes, In-service Teachers, Motivation, Social Aspects of Learning and Teaching
Presenting Author: Alexander Jonas Jung, Hector Research Institute of Education Sciences and Psychology, Germany; **Co-Author:**Cora Parrisius, University of Education Karlsruhe, Germany; **Co-Author:**Benjamin Nagengast, Eberhard Karls Universität Tübingen, Germany; **Co-Author:**Kou Murayama, Eberhard Karls Universität Tübingen, Germany

Interactions between teachers and students are mostly studied according to one-dimensional theories: Researchers analyse how teachers impact students. However, recent theoretical papers emphasize potential reciprocal effects in the classroom. Students' behaviour and motivation are not only influenced by teachers but are also assumed to influence teachers' motivation and behaviour in return. The field's empirical evidence on reciprocal effects between students and teachers, though, is scarce. Using an explorative approach, we were able to gain new insights on reciprocal relationships between teachers and students. We estimated a total of 1716 bivariate cross-lagged panel-models between 44 student-rated and 39 teacher-rated scales for a sample of 181 German classrooms measured at 5 times over a one-year period. We found that student-ratings are as predictive for the change in subsequent teacher-ratings as teacher-ratings are predictive for subsequent student-ratings, supporting the emerging theories of reciprocal effects between teachers and students. Furthermore, we found that students' perceptions of teachers are more predictive for subsequent changes in teachers than students' self-ratings of, for example, interests, effort, and motivation. Our results allow to further the development of more fine-grained theories on interactions between teachers and students.

Dynamic social network perspective on interaction in collaborative learning in elementary classrooms
Keywords: Cooperative/Collaborative Learning, Dialogic Pedagogy, Peer Interaction, Social Interaction
Presenting Author: Tomáš Lintner, Masaryk University, Czech Republic; **Co-Author:**Tomáš Diviák, University of Manchester, United Kingdom; **Co-Author:**Zuzana Šalamounová, Masaryk University, Czech Republic; **Co-Author:**Klara Sedova, Masaryk University, Czech Republic; **Co-Author:**Martin Sedláček, Masaryk University, Czech Republic; **Co-Author:**Roman Švaříček, Masaryk University, Czech Republic

Collaborative learning has potential to promote student peer relationships, help to develop positive learning attitudes, and improve learning outcomes. Moreover, the more students talk, the more they learn. On the other hand, student disengagement from a collaborative task renders the task useless. It is therefore beneficial to understand the processes driving interactions of individual students during collaborative tasks and processes leading to some students being excluded from group interactions. This research builds on videorecorded collaborative tasks collected from 40 groups – each comprising 3 to 6 students – from 6 Czech elementary classrooms. The collaborative tasks were implemented by 6 different teachers under the supervision of our research team as part of a larger research project aimed at improving communication in classrooms. This research employs dynamic network actor models to addresses the question “What influences interaction during collaborative tasks in elementary classrooms?”. The results suggest that our collaborative tasks minimized the differences between vocal and silent and popular and unpopular students in communication. Gender homophily in communication was also minimized and reciprocity of communication was high.

Assessing a peer mediation teaching intervention in primary school: Pupils’ perceptions
Keywords: Communication Skills, Peer Interaction, Primary Education, Qualitative Methods
Presenting Author: Angeliki Lithoxoidou, University of Western Macedonia, Greece

Conflict in school settings is a phenomenon that obstructs the teaching process and disrupts classroom climate in general. Additionally, conflicts may include physical and verbal violence; thus, entailing serious consequences for pupils. Conflict resolution education and peer mediation may stand as means of peacefully resolving school conflicts; thus protecting school communities against violence. Simultaneously, conflict resolution programs equip pupils with skills considered as appropriate for every domain of their social life, such as communication, problem-solving and decision-making. This study focuses on a conflict resolution program with emphasis on peer mediation carried out in the 4^{th} and 5^{th} class of two primary schools in a semi-urban area. It aimed at: a) designing and implementing a twelve-hour teaching intervention for pupils to be instructed in order to become mediators as well as b) assessing the intervention in the light of pupils’ perceptions. As the analysis of the qualitative data indicated, pupils seem to have acquired conflict resolution skills, cultivated the concept of justice and care as well as exhibited prosocial attitudes. These findings probably suggest that pupils –even from a young age– can be empowered in order to construct a values framework when they play an active role in conflict resolution programs.

Session I 16

24 August 2023 12:00 - 13:30
UOM_A05
Single Paper
Cognitive Science, Teaching and Teacher Education

English as a Foreign Language and Bilingual Education

Keywords: Bilingual Education, Cognitive Development, Competencies, Foreign and Second Language Acquisition, Metacognition, Migrant / Refugee and Minority students, Mixed-method Research, Multicultural Education, Pre-service Teachers, Qualitative Methods, Quantitative Methods, Self-efficacy, Social Sciences and Humanities, Teacher Professional Development
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 11 - Teaching and Teacher Education, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Erika Maksniemi, University of Helsinki, Finland

Effect of Linguistic challenges on pre-service teachers’ self-efficacy in English medium instruction
Keywords: Foreign and Second Language Acquisition, Mixed-method Research, Pre-service Teachers, Self-efficacy
Presenting Author: Charles Selorm Dzormeku, University of Turku, Finland; **Co-Author:**Koen Veermans, University of Turku, Finland; **Co-Author:**Jake McMullen, University of Turku, Finland

This study attempts to categorize Ghanaian pre-service teachers according to the levels of linguistic challenges they encounter due to English Medium Instruction (EMI). It further explores the disparities between the self-efficacy belief levels of these groups with reference to their EMI linguistic challenges. Adopting a sequential mixed method approach, a total of 300 participants were surveyed in the Ashanti region of Ghana, followed up by 8 interviews. Participants completed the 45-item EMI challenges instrument (Aizawa et al., 2020) and the short form of the Teachers’ Sense of Efficacy Scale (Tschannen-Moran & Hoy, 2001). Eight participants also participated in a semi-structured interview based on the findings from the quantitative analysis. Writing was the most challenging of the four language skills for pre-service teachers in Ghana. Moreover, the prevailing evidence suggests that limited vocabulary, inability to develop coherent paragraphs, pronunciations, and orthographical as well as grammatical inaccuracies, are the paramount challenges participants face. A Latent Profile Analysis revealed four groups with different levels of EMI linguistic challenges among participants. A series of ANOVA conducted also indicated that the

higher the EMI linguistic challenges of a group, the lower their self-efficacy beliefs in their teaching ability. These results suggest that more emphasis should be placed on English language teaching during teacher education programs. Further research should also examine effective pedagogical approaches to enhance English language acquisition from the basic school level to the higher education level.Keywords: English Medium Instruction; language skills; pre-service teacher; teacher self-efficacy beliefs

Teacher students' understanding of migrants' identities in fiction in the context of EFL
Keywords: Migrant / Refugee and Minority students, Multicultural Education, Social Sciences and Humanities, Teacher Professional Development
Presenting Author: Jon Brodal, Western Norway University of Applied Sciences, Norway

The proposed study sets out to examine how teacher students understand migrant identity issues in fiction in the context of ESL – English as a second language – and how they plan to teach identity issues to pupils. Data are collected from interviews with the students and from their term papers on fiction that thematizes migrant and minority identity. i.e. Hanif Kureishi's *My Son the Fanatic* and Sherman Alexie's *The Absolutely True Diary of a Part-Time Indian*. The study is expected to be completed in spring 2023. The theoretical framework of the analysis will consist of Anthony Giddens' theory on reflexive identity, Peggy Levitt's theory on transnationalism and Edward Said's concept of Orientalism. Of particular interest is whether migrants' identities are recognized as products of the reflexive, self-conscious choices that according to Giddens constitute selfhood in late modernity or whether they are interpreted as expressions of traditional identity patterns or cultural alienation. If migrant selfhood is consistently misrepresented as the incapable Other of the Western reflexive Self it could potentially hamper the identity learning outcomes of pupils, particularly those with migrant backgrounds.

Capturing Professional Bilingual Teachers' Conceptualisation(s) of their Professionalism
Keywords: Bilingual Education, Competencies, Qualitative Methods, Teacher Professional Development
Presenting Author: Luisa Scherzinger, University of Tübingen, Germany; **Co-Author:**Taiga Brahm, University of Tübingen, Germany

Bilingual teachers need to have an extended range of competences as they integrate content and language as well as intercultural aspects during lesson planning. Existing theoretical competence frameworks for Content and Language Integrated Learning (CLIL) emphasise this fact, however, these theoretical constructs have not yet been compared with bilingual education practitioners' perceptions of their own professionalism. This mixed-methods study addresses this research gap by capturing the conceptualisations of professionalism in two groups: experienced bilingual education teacher educators, who are still active as in-service teachers, and bilingual education trainee teachers taking part in a bilingual education training program. Both groups were teaching at German Grammar schools. We analysed data from an online questionnaire (n = 32) and semi-structured interviews (n = 11) using qualitative content analysis as well as descriptive statistics. Our findings emphasise the importance of high motivation, additional psychological-pedagogical knowledge, internationally-oriented content knowledge as well as high language proficiency and yield important implications for bilingual teacher training. Our study is theoretically relevant as it extends the knowledge about CLIL teachers' professionalism and in parts, also their professional development. At the same time, it highlights the need for further support for bilingual teachers, for instance, in the form of learning material.

Effects of inhibitory control on language development in dual-language learning preschoolers
Keywords: Bilingual Education, Cognitive Development, Metacognition, Quantitative Methods
Presenting Author: Robin Segerer, University of Basel, Switzerland; **Co-Author:**Leila Teresa Schächinger Tenés, Faculty of Psychology, University of Basel, Switzerland, Switzerland; **Co-Author:**Jessica Carolyn Weiner, University of Basel, Switzerland; **Co-Author:**Alexander Grob, University of Basel, Switzerland

For decades, it has been assumed that dual language learners develop a special advantage in inhibitory control in comparison to single language learners. This is explained by the assumption that dual language learners actively inhibit the one of their languages they do not use in a communicative situation (Bialystok, 2010). Recently, however, Giguere et al. (2022) assumed that the dual language learning advantage in inhibition may be better explained by a specific selection effect. A special relationship between dual language learners' societal language competence and inhibitory control might cause the inhibition advantage of dual language learners if the drawn sample of dual language learners has non-representatively high levels of societal language skills. We examined this hypothesis with longitudinal data from a cohort-sequence study with single and dual language learning preschoolers in Switzerland and Germany. At present, 317 single and 214 dual language learners ($M_{baseline\text{-}age}$(SD) = 48.60(8.08) months; 50% girls) with the societal languages French (32%) or (Swiss-)German (68%) and the heritage languages Turkish (50%) or Italian (50%) participated. Children were assessed in average over 20 months across three measurement points. Inhibitory control, societal and also heritage language skills were assessed via standardized tests. Longitudinal inhibitory control effects, were found in the societal language sentence comprehension test only. As anticipated, the proficiency increase was more strongly positively predicted by inhibitory control in dual than single language learners. The effects longitudinally confirm the assumption of a special importance of inhibitory control for the societal language development in young dual language learners.

Session I 17

24 August 2023 12:00 - 13:30
AUTH_DC3
Single Paper
Teaching and Teacher Education

Pre-Service Teachers' Competencies

Keywords: Competencies, Curriculum Development, Peer Interaction, Pre-service Teachers, Q-methodology, Resilience, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education, SIG 13 - Moral and Democratic Education
Chairperson: Laura Outhwaite, University College London, IOE, United Kingdom

Reflective Competence Development in Teacher Education – Becoming Professional through Podcasting
Keywords: Competencies, Peer Interaction, Pre-service Teachers, Teacher Professional Development
Presenting Author: Annette Busse, University of Kassel, Institute of Educational Science, Germany; **Presenting Author:**Dorit Bosse, University of Kassel, Institute of Educational Science, Germany

This paper focuses on the concept of reflective competence development which comprises the aim to promote professional competence during teacher education. Reflective competence development is understood as the development of competences evolving reflectively with the aim of acquiring professional competence. From a didactical point of view, learning environments that can be linked to this conceptualization of reflective competence development are necessary to focus on the students' learning process. This is realized by the didactical use of collaborative podcasts to improve their professional vision of classroom management: Students are seen as knowledge creators where self-created podcasts support the promotion of deeper learning. With this approach, we pursue the question of whether the learning environment, in which student teachers produce collaborative podcasts in pairs of two, supports them in acquiring professional vision and leads to a change in beliefs. Podcasting addresses the willingness to reflect as a basic attitude. We present results of a study in a pre-post control group design (N_{EG} = 242; N_{CG} = 180) while the experimental group produces podcasts in contrast to the control group. A preliminary study suggests that professional vision can be enhanced through the production of collaborative podcasts compared to writing blogs. Additionally, we want to analyse the change in beliefs and the willingness to reflect via podcasting.

Principals' views on new teachers' competence – A Q study in Sweden
Keywords: Competencies, Pre-service Teachers, Q-methodology, Teacher Professional Development
Presenting Author: Adrian Lundberg, Malmö University, Sweden; **Presenting Author:**Philippe Collberg, Halmstad University, Sweden; **Presenting Author:**christina lindh, Faculty of Teacher Education, University of Kristianstad, Sweden

The transition from pre-service education to in-service teaching can result in a reality shock. Negative experiences might lead to new teachers suffering from ill-being and leaving the profession. This contributes to a teacher shortage, which is currently lingering in various countries. This study aims to contribute to a better

understanding of a possible gap between newly qualified teachers' professional competence and the profession's requirements. Data is drawn from school principals' participation in a Q methodological study in Sweden. They were sampled because of their critical role in teachers' transition into their professional practice. Results show some consensus regarding new teachers' ability to plan teaching, offer pupils different ways of expressing their knowledge and work with digital tools. In addition, principals are skeptical if new teachers can competently deal with pupils with special needs, or parents in difficult conversations. The analysis also yields a range of disagreements among principals and illustrates the complexity of the subject matter. The study accentuates the importance of distinguishing between formal and actual teacher competence. While new teachers are regarded as competent in the theoretical and even practical aspects of their professional activity, they struggle with the real and situated enactment of their plans. The study presents suggestions for future research and evidence-based recommendations for policy and practice.

How do pre-service teachers perceive the teacher's role in guiding students' peer interactions?
Keywords: Competencies, Peer Interaction, Pre-service Teachers, Teacher Professional Development
Presenting Author: Olli-Pekka Heinimäki, University of Turku, Finland; **Co-Author:**Anu Kajamies, University of Turku, Finland; **Co-Author:**Mikko Tiilikainen, University of Turku, Finland; **Co-Author:**Marja Vauras, University of Turku, Finland

Peer interactions are vital for individual development and learning, and therefore teachers must provide meaningful peer interaction opportunities. However, just providing such opportunities does not guarantee positive outcomes, highlighting the crucial role of the teacher in guiding peer interactions. This guidance can, however, challenge teachers as it might require them to adopt new kinds of roles they are less familiar with. To this end, the main aim of the present study was to shed light on how pre-service teachers perceive the teacher's role in guiding peer interactions. Furthermore, the ways the pre-service teachers evaluate their own competencies in that regard, and how these perceptions and self-evaluations possibly evolve over time, are also examined for further insights. The participants were second-year classroom teacher students enrolled in a course on teacher interaction skills. The data were collected with an electronic questionnaire at the beginning (N=56) and the end (N=51) of the course, containing 16 closed (quantitative analysis) and one open-ended question (qualitative analysis). The analysis revealed five distinct roles: instructor, supported, modeler, enabler, and facilitator. Qualitative differences were also identified, relating to perceived role flexibility and depth of reasoning concerning the mentioned roles. The conference presentation will elaborate on these preliminary findings. Furthermore, we also examine how these perceptions possibly differed between the pre- and post-questionnaire, and how the students' self-evaluated competencies could bring further clarity to these perceptions. Finally, the implications for practice and teacher education will be discussed.

Teacher education in conflict-affected societies: What future teachers in Iraq learn post-ISIS?
Keywords: Competencies, Curriculum Development, Pre-service Teachers, Resilience
Presenting Author: Vasileios Symeonidis, University of Education Freiburg, Germany; **Presenting Author:**Heike Wendt, University of Graz, Austria; **Presenting Author:**Amal Zedan, University of Mosul, Iraq; **Co-Author:**Felix Senger, TU Dortmund University, Germany; **Co-Author:**Saraa Salim, University of Mosul, Iraq; **Co-Author:**Fawzi Jebrail Ibrahim, University of Mosul, Iraq

Considering the critical role of teachers in post-conflict societies, little is known about the challenges with initial teacher education in post-crisis contexts, or about the quality of teaching in such contexts. This paper aims to identify the challenges with providing quality teaching and teacher education in crisis situations by studying the case of Mosul University in Iraq. Focusing on developments post-Islamic State, the study looks at expert interviews with teacher educators at different faculties of Mosul University and analyzes the development and implementation of the teacher education curriculum. Our findings provide insights into teacher education structures in Iraq and the broader challenges presented by crisis contexts. A core challenge appears to be the centralized curriculum, which focuses on subject specific knowledge rather than other types of knowledge that are of key importance for prospective teachers in areas affected by conflict.

Session I 18

24 August 2023 12:00 - 13:30
AUTH_DC1
Single Paper
Motivational, Social and Affective Processes

Family Beliefs, Attitudes and Relationships: Associations with Children Social Skills

Keywords: Early Childhood Education, Motivation, Parents' Beliefs and Affect, Peer Interaction, Quantitative Methods, Self-concept, Self-determination, Social Development, Social Interaction
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 08 - Motivation and Emotion
Chairperson: - Dangeni, Newcastle University, United Kingdom

Childbearing motivation, postpartum depression, and child adjustment: A 5-year longitudinal study
Keywords: Early Childhood Education, Motivation, Parents' Beliefs and Affect, Self-determination
Presenting Author: Reut Nachoum, Bar Ilan University, Israel; **Co-Author:**Anat Moed, Bar Ilan University, Israel; **Co-Author:**Nir Madjar, Bar Ilan University, Israel; **Co-Author:**Yaniv Kanat-Maymon, Reichman University, Israel

Postpartum depressive symptoms (PDS) are not only highly prevalent but also considered to significantly harm child development. Using a Self-Determination Theory framework, the current study aims to examine whether autonomous (volition and self-fulfillment) and controlled (coercion or guilt) childbearing motivations serve as early factors of PDS. This study suggests a process model in which prenatal childbearing motivations predict PDS, which, in turn, predicts autonomy-supportive versus controlling parenting styles and child developmental functions years later. Data were longitudinally collected from 324 Israeli mothers who reported their childbearing motivations during pregnancy, PDS at four months postpartum, parenting styles at 20 months postpartum, and child adjustment at 4.5 years. Child adjustment included behavior problems (internalizing, externalizing), social functioning (prosocial behavior, peer problems), emotional functioning (emotion regulation, lability), and mastery motivation (mastery pleasure, negative reaction).A structural equation modeling revealed autonomous and controlled prenatal childbearing motivations were negatively and positively associated with PDS at four months, respectively. PDS, in turn, was positively associated with controlling parenting style at 20 months but was not significantly associated with autonomy-supportive parenting. However, autonomous motivation was directly associated with autonomy-supportive parenting. Then, autonomy-supportive parenting at 20 months increased child adaptive functioning and decreased maladaptive behaviors at 4.5 years. Controlling parenting increased maladaptive behaviors while undermining adaptive functioning. Our study underscores the importance of childbearing motivations as early indicators of PDS, parenting styles, and child adjustment. Knowing the possible influences of childbearing motivations may encourage parents to pay closer attention to autonomous reasons when expanding their family.

Relations between maternal perfectionism, young children's forgiveness, and social skills
Keywords: Early Childhood Education, Parents' Beliefs and Affect, Peer Interaction, Social Development
Presenting Author: Bertha Hei Ching Kum, The Education University of Hong Kong, Hong Kong; **Co-Author:**Sum Kwing Cheung, The Education University of Hong Kong, Hong Kong; **Co-Author:**Rebecca Y. M. Cheung, University of Reading, United Kingdom

Previous research suggested that parental expectations are linked with social outcomes in children. It should, however, be noted that there are different ways for parents to express their high expectations. Inspired by studies on perfectionism in the family setting, the present study sought to examine whether mothers' perfectionistic strivings about children (i.e., setting high performance standards for children) and perfectionistic concerns about children (i.e., critical evaluations of the discrepancy between the ideal and actual performance of children) were related to their young children's social skills. In addition to parental expectations, forgiveness is often found to predict social skills. Hence, another aim of the present study was to examine whether the relations between parents' perfectionistic tendencies and young children's social skills were mediated by young children's forgiveness. Participants were 238 kindergarten children and their mothers in Hong Kong. Mothers were asked to report their perfectionistic tendencies about children, children's forgiveness, and social skills through a questionnaire. Results of path analysis showed that after controlling for children's age, mothers' perfectionistic strivings about children only had a positive direct link with children's social skills. Mothers' perfectionistic concerns about children, on the other hand, had a negative direct link with children's social skills, as well as an

indirect link via children's forgiveness. These findings suggest the importance of helping parents understand how to express their expectations to young children in a constructive manner, so as to better promote their young children's early social skills development.

Profiles of sibling relationships and their association with social-emotional skills
Keywords: Peer Interaction, Quantitative Methods, Self-concept, Social Interaction
Presenting Author: Elena Wittmann, Leibniz Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:**Ilka Wolter, Leibniz Institute for Educational Trajectories (LIfBi), Germany

Although the influence of the family environment on social-emotional skills is hardly disputed, research predominantly focuses on the parent-child relationship. However, most people grow up with at least one sibling. Siblings fulfil important socialisation functions for each other; they argue and disagree, share and cooperate, and learn to resolve conflicts among themselves. This paper aims at describing the quality of the sibling relationship and its connection with social-emotional competencies. Using latent profiles and regression analyses, it can be shown that the perceived quality of the sibling relationship is closely related to prosocial behavior, problem behavior, and self-esteem. Therefore, the sibling relationship deserves more attention both in research and in clinical settings.

Session I 19

24 August 2023 12:00 - 13:30
UOM_R05
Single Paper
Motivational, Social and Affective Processes, Teaching and Teacher Education

Teacher Emotions

Keywords: Emotion and Affect, Higher Education, In-service Teachers, Mentoring and Coaching, Pre-service Teachers, Primary Education, Quantitative Methods, Secondary Education, Social Aspects of Learning and Teaching, Teaching Approaches
Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education
Chairperson: Izaak Dekker, Amsterdam University of Applied Sciences (AUAS), Netherlands

Teacher Education and Social and Emotional Learning: A Swedish Case Study of Intended Curriculum
Keywords: Emotion and Affect, Pre-service Teachers, Primary Education, Social Aspects of Learning and Teaching
Presenting Author: Blanka Rósa, Stockholm Univerisity, Sweden

International and national initiatives to reframe the concept of quality education increasingly highlight the importance of attending to the holistic developmental needs and health of all pupils. Accordingly, teachers are expected to do more than attend to pupils' academic progression. The task of a teacher inevitably involves caring for pupils' social and emotional learning too, yet, teachers' ability to attend to social and emotional developmental needs is highly dependent on the training they receive. The focus of this present study was then to investigate how social and emotional learning is integrated into the curriculum of a K-3 teacher education programme at a large university in Sweden. Policy documents governing the intended aims of the teacher education programme were collected, and semi-structured interviews with course leaders were conducted. Informed by the CASEL framework's conceptualisation of social and emotional learning, a qualitative content analysis was carried out on all data. The preliminary results point in two directions: firstly, references to social and emotional learning seem to be present in the curriculum but are implicit, and secondly, this implicit focus is predominantly laid on the social dimension of the concept while the emotional learning aspect is rather neglected. These results imply insufficiencies in how teacher education lives up to the expectations set by the national curriculum. The findings serve as an important basis both for comparisons with other K-3 teacher education curricula in and outside of Sweden and for contrasting them with teacher students' and teachers' experiences of the training they undergo.

Genuine, Faked, and Hidden Teacher Emotions in the Classroom: Are they Transmitted to Students?
Keywords: Emotion and Affect, In-service Teachers, Quantitative Methods, Secondary Education
Presenting Author: Irena Burić, University of Zadar, Croatia; **Co-Author:**Aleksandra Huic, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia; **Co-Author:**Barbara Balaž, Catholic University of Croatia, Croatia

Teacher emotions experienced in the classroom can be transmitted to students. However, to make their emotional expressions appropriate to classroom situations, teachers can choose to genuinely express, fake, or hide their experienced emotions. Thus, to fully understand emotional transmission in the classroom, it is important to consider strategies teachers use to regulate their emotional expressions. This study examined the associations of genuinely expressed, faked, and hidden teacher emotions with student achievement emotions. In total, 1006 teachers (733 females) and 14339 students (8773 females) from 73 secondary schools in Croatia participated in the study. Teachers' self-reports on genuine expression, faking, and hiding of positive (e.g., enthusiasm, excitement, pride, happiness) and negative emotions (e. g, anger, shame, anxiety, disappointment, hopelessness) were matched with students' self-reports on class-related achievement emotions (i.e., enjoyment, hope, pride, anger, anxiety, shame, hopelessness, boredom). Multilevel structural equation modeling (MSEM) showed that genuine expression of teacher positive emotions is positively related to all student positive emotions, while genuine expression of teacher negative emotions was positively related to all student negative emotions. Next, genuine expression of positive emotions was negatively associated with students' negative emotions, while genuine expression of negative emotions was negatively associated with students' positive emotions. In addition, faking negative emotions was positively related to students' anger, anxiety, and hopelessness, while hiding negative emotions was positively related to students' anger, shame, and hopelessness. Lastly, teachers' faking and hiding of positive emotions were unrelated to students' class-related emotions. This work was supported by Croatian Science Foundation (Grant No. IP-2019-04-5472).

The passion transmission model: Examining the mediating role of emotions
Keywords: Emotion and Affect, Higher Education, Social Aspects of Learning and Teaching, Teaching Approaches
Presenting Author: Tanya Chichekian, Université de Sherbrooke, Canada; **Co-Author:**Robert Vallerand, Université du Québec à Montréal, Canada

In accordance with the Dualistic Model of Passion, a passion transmission model was examined in which teachers' passion and autonomy support were hypothesized to influence students' passion for a subject matter via positive and negative emotions. In Study, a path analysis with 208 teachers through an online recruitment showed that teachers' autonomy support and passion for teaching led them to experience more positive emotions and fewer negative emotions in their classes. In addition, positive emotions while teaching were positively associated with teachers' perceptions of their students' harmonious passion, while both positive and negative emotions were associated with perceptions of their students' obsessive passion. In Study 2, a university-wide recruitment of 123 university professors described the extent to which they considered themselves as passionate for teaching and how they displayed this behavior in class. Developing a relationship with students was the most prominent feature regarding professors' passion for teaching. Specifically, professors displayed actions related to facilitating student interactions, acting as a role model, developing students' interest, making the course material relevant, incorporating student feedback in teaching, and maintaining students' motivation as behavioral actions related to their passion for teaching. Overall, these findings are the first to propose a passion transmission model in education. Implications for such a model and the mediating role of emotions are discussed.

Mentoring teachers' perspective of student teachers' emotional challenges
Keywords: Emotion and Affect, Higher Education, Mentoring and Coaching, Pre-service Teachers
Presenting Author: Henrik Lindqvist, Linköping University, Sweden; **Co-Author:**Maria Weurlander, Stockholm University, Sweden; **Co-Author:**Linda Barman, KTH, Royal Institute of Technology, Sweden; **Co-Author:**Annika Wernerson, Karolinska Institutet, Sweden; **Co-Author:**Robert Thornberg, Linköping University, Sweden

Learning to work as a teacher in teacher education includes encountering schools during work-based learning. This period includes having mentoring teachers assigned to support student teachers in acquiring teaching skills and guiding in understanding teachers' work. Mentoring conversations are commonly carried out, but rarely focus on student teachers' coping with emotional challenges. Therefore, we aimed to investigate mentoring teachers' perspectives on scenarios

on student teachers' reported emotional challenges. We conducted a constructivist grounded theory study where 22 mentoring teachers were interviewed, using scenarios from student teachers' narratives. The data were analysed through initial, focused, and theoretical coding. The findings show that mentoring teachers' main concern was that student teachers should consider all situations, including emotionally challenging episodes, as opportunities for learning. When discussing the scenarios, they emphasized strategies that involved regulating, engaging/helping, being exemplary, and taking charge. The findings are discussed in relation to existing literature on mentoring. This study is theoretical and educational significant as we use the perspectives of the mentoring teachers in relation to student teachers' emotional challenges. Mentoring teachers' perspectives are important, if we want student teachers experiences during work-based learning to soften the practice shock associated with being a new teacher.

Session I 20

24 August 2023 12:00 - 13:30
UOM_R02
Poster Presentation
Developmental Aspects of Instruction, Higher Education, Instructional Design, Learning and Instructional Technology, Teaching and Teacher Education

Learning and Instruction during COVID-19

Keywords: Attitudes and Beliefs, Burnout, Cognitive Skills and Processes, Communication Skills, Educational Policy, Educational Technologies, Higher Education, In-service Teachers, Instructional Design, Learning Analytics, Pandemic, Primary Education, School Leadership, Science Education, Student Drawings, Teaching/Instructional Strategies, Well-being
Interest group: SIG 04 - Higher Education, SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education, SIG 17 - Methods in Learning Research
Chairperson: JUNYI YANG, University of Oslo, Norway

Patterns of Teachers' Occupational Well-Being During the COVID-19 Pandemic
Keywords: Attitudes and Beliefs, In-service Teachers, Primary Education, Well-being
Presenting Author: Sanni Pöysä, University of Jyväskylä, Finland; **Co-Author:**Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

This study examined profiles of teachers' occupational well-being during the COVID-19 pandemic, and possible differences in self-reported experiences of exhaustion, recovery, and interactional styles of teaching between the profile groups. The data were collected from 279 Finnish primary school teachers during the spring of 2020. The Latent Profile Analysis was used, and four profiles were identified: 1) teachers with mediocre stress and work engagement (34.4%); 2) teachers with mediocre stress and lowest work engagement (11.5%); 3) teachers with highest stress and work engagement (26.5%); and 4) teachers with lowest stress and highest work engagement (27.6%). The findings indicated that there was diversity in ways on how different negative and positive aspects of occupational well-being were drawn into patterns. The further analyses were done to examine the extent to which the profile groups would differ with respect to teachers' experiences of emotional exhaustion, recovery from work, and interactional styles of teaching. The results revealed that during the first few months of the COVID-19 pandemic many teachers experienced occupational stress as well as some increase in stress due to the pandemic. In addition, the findings provided new insights concerning how teachers' work engagement was perhaps not severely affected during the first few months of the pandemic, and on how different teaching styles were associated specifically with different aspects of occupational well-being.

A comparison of students' well-being before, during and after the peak of the COVID-19 pandemic
Keywords: Burnout, Higher Education, Pandemic, Well-being
Presenting Author: Josina Schriek, University of Hildesheim, Germany; **Co-Author:**Bastian Carstensen, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**Renate Soellner, University of Hildesheim, Germany; **Co-Author:**Uta Dr. Klusmann, Leibniz Institute for Science and Mathematics Education (IPN), Germany

The mitigation measures to suppress the spread of the COVID-19 virus led to significant disruptions in everyday life at university. Educational institutions had to close and university students faced unprecedented economic, social and educational challenges across multiple life domains (e.g. social isolation, financial pressure). Cross-sectional studies show that those demands were associated with higher depression and stress accompanied by lower motivation and engagement. Students' well-being is strongly associated with their performance. For example, students with low burnout levels and high satisfaction levels show better academic performance and lower dropout rates. However, longitudinal studies focusing on students' well-being before, during, and after the first peak of the COVID-19 pandemic are scarce. The aim of the present study is to examine how student well-being evolves during the period January 2020 to January 2022. A total of $N = 1{,}800$ students assessed their emotional exhaustion and enthusiasm at three measurement points. Multilevel models revealed that emotional exhaustion levels are significantly higher in 2021 ($\gamma_{10} = 0.44$, p

Children's descriptions and drawings of SARS-CoV-2
Keywords: Pandemic, Primary Education, Science Education, Student Drawings
Presenting Author: Vasilia Christidou, Aristotle University of Thessaloniki, Greece; **Co-Author:**Fotini Bonoti, University of Thessaly, Greece; **Co-Author:**Penelope Papadopoulou, University of Western Macedonia, Greece; **Co-Author:**Polixeni Doumpala, Aristotle University of Thessaloniki, Greece

Although the consequences of the COVID-19 pandemic on children have been vastly examined by research over the last years, children's perspective of SARS-CoV-2 has not been investigated extensively. This study examined children's conceptions of SARS-CoV-2 and if these vary according to their age, the mode of expression or the time they are recorded during the evolution of the pandemic. The sample consisted of 1072 children in Greece, distributed in to three age groups with a mean age of 5, 7, and 9 years, who were asked to verbally describe and draw Coronavirus during the first (2020, n = 342), second (2021, n = 271), and third (2022, n = 459) phase of the pandemic. Content analysis of the data revealed four main themes, namely (a) Coronavirus, (b) Medical dimensions, (c) Psychological implications, and (d) Social implications. Results indicated that children, across all age groups and since the beginning of the pandemic, have developed a complex and multidimensional construct about the novel coronavirus, which is not restricted to SARS-CoV-2 per se, but also involves medical, psychological, and social dimensions of COVID-19. Moreover, children tend to emphasise different aspects of SARS-CoV-2 according to their age, mode of expression, and pandemic phase.

A learning analytics approach to teachers' use of ICT during and after the COVID-19 health crisis
Keywords: Educational Technologies, Learning Analytics, Pandemic, Primary Education
Presenting Author: Catalina Lomos, LISER - Luxembourg Institute for Socio Economic Research, Luxembourg; **Co-Author:**Hans Luyten, University of Twente, Netherlands; **Co-Author:**Frauke Kesting, SCRIPT (Service de Coordination de la Recherche et de l'Innovation pédagogiques et technologiques), Luxembourg; **Co-Author:**Filipe Lima da Cunha, SCRIPT (Service de Coordination de la Recherche et de l'Innovation pédagogiques et technologiques), Luxembourg

Teachers' use of ICT has been paid significant attention, especially during the COVID-19 health crisis, when a tremendous sense of urgency was imposed on teachers' work. We saw an increase in teachers' use of ICT during the school lockdown periods in most educational systems. The relevant question that follows is if teachers continued using ICT in the same numbers in the years following the COVID-19 health crisis and which characteristics would be relevant for a sustained ICT use. In this study, we used the log data of 800 teachers working on a digital learning platform for mathematics in 2019-2020, and their descriptive data for two years before and two years after that year. Our findings show that in the two years following the COVID-19 health crisis year, teachers went back to their ICT presence specific for the two years before the same year. More specific, the teachers who continued in the highest numbers to work actively on the platform in the following two years were those who spent more time on the platform during COVID-19 school lockdown, who had previous experience with the learning platform, and who performed meaningful ICT-behaviors while online. We used the SAMR model to describe and categorize teachers' ICT behavior. This work facilitates the reflection on the dynamics of the change and adoption process and the relevant role of intrinsic motivation for the continuation and

persistence of an adopted behavior.

Re-Personalizing and Re-Socializing the Cognitive Processes of Distance Learning
Keywords: Cognitive Skills and Processes, Instructional Design, Pandemic, Teaching/Instructional Strategies
Presenting Author: William Whitten II, Total Experience Design, LLC, United States; **Co-Author:**Sandra E. Whitten, Fordham University, United States

The pandemic of 2020-2021 created an acute need for students to engage in distance learning. Current technology, while miraculous in some respects, limits student-to-student and student-to-teacher interactions. These limitations, combined with a greater emphasis on homework, have de-personalized and de-socialized distance learning. Distance learning can be re-personalized and re-socialized, and in general made more effective and engaging, by designing homework questions that evoke learning-effective cognitive processes which naturally occur in the interactive classroom environment. Guided Cognition is a new instructional design approach where homework tasks are designed to guide learners to engage in specific, observable cognitive events that are hypothesized to elicit underlying theoretical cognitive processes that result in learning. Several observable cognitive events were abstracted from normal classroom instructional interactions and activities. The cognitive events studied in our experiments are: relate to prior experience, visualize and illustrate, consider divergent answers, brainstorm and evaluate, and role play. Students read a section of a novel, and then were assigned either Traditional or Guided Cognition homework questions. Three days after the homework, they were given a surprise quiz on the content of the novel. Students assigned Guided Cognition homework performed about 10 percentage points better than students assigned Traditional homework questions.Distance learning tends to include a larger proportion of learning time with characteristics of traditional homework: unsupervised, individual, self-paced, solitary, self-monitored, and informal. Guided Cognition Design enriches distance learning homework questions, giving students the benefits of engaging in learning-effective cognitive processes typically experienced in more personal and more social learning environments.

Teachers' Perception of miscommunication between educational policy and schools during COVID-19
Keywords: Communication Skills, Educational Policy, Pandemic, School Leadership
Presenting Author: Julia Hafenscher, University of Vienna, Austria; **Co-Author:**Flora Woltran, University of Vienna, Austria

With the rise of COVID-19 cases in 2020, uncertain and chaotic periods for students and teachers all over the world began. In times of crisis, a trustworthy and clear communication by educational policy is essential. The aim of this study is to investigate teachers' perception of communication by educational policy makers during COVID-19 pandemic. In study 1, data from 907 teachers, which participated in a nationwide online-survey, were analyzed. In study 2, five semi-structured online-interviews were conducted with teachers. Overall, the results show that a large number of teachers perceived that education policymakers have failed to communicate measures and information for school in a timely manner as well as in clarity during the first three years of the COVID-19 pandemic.

Session I 21

24 August 2023 12:00 - 13:30
UOM_R01
Poster Presentation
Assessment and Evaluation, Cognitive Science, Learning and Special Education, Motivational, Social and Affective Processes

Reading Comprehension

Keywords: Achievement, At-risk Students, Cognitive Development, Comprehension of Text and Graphics, Educational Technologies, Engagement, Interest, Learning and Developmental Difficulties, Meta-analysis, Motivation, Primary Education, Reading, Science and STEM, Self-efficacy, Teaching/Instructional Strategies
Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 08 - Motivation and Emotion, SIG 14 - Learning and Professional Development
Chairperson: Radel James Gacumo, University of Stavanger, Norway

Writing your own story about a statistical graph is more interesting than reading one
Keywords: Engagement, Interest, Science and STEM, Teaching/Instructional Strategies
Presenting Author: Liva Martinussen, University of Oslo, Norway; **Co-Author:**Anine Riege, University of Oslo, Norway; **Co-Author:**Rolf Reber, University of Oslo, Switzerland

Despite a need for more people educated in STEM-fields it has become a less popular study choice. Interventions to increase situational interest (SI) may serve as a starting point for individual interest. One way to increase SI could be by asking students to write stories. In an online between-Ss experiment, we examined the effect of writing a story about a graph, compared to reading a story, on SI. We also explored if differences in instructional wording affected SI differently depending on whether it asked participants to make a story interesting for others or to themselves. Students were recruited via Prolific and randomized into groups instructed to either write a story interesting for others (n = 157), themselves (n = 170), or read a story (n = 179), to either an increasing or decreasing graph. Triggered-, Maintained-feeling, and Maintained-value-scales were administered to measure the different facets of SI. A 2x3 ANOVA for each SI facet, with instructional group and type of graph as independent variables yielded a significant main effect of instructional group on triggered SI. Triggered SI was significantly lower for the reading-group compared the other-group and the self-group, respectively. We found no effect of instructional wording (interesting for yourself versus others). These findings suggests that writing stories, compared to reading a story, increases triggered SI. As triggered SI, according to the empirically supported model by Hidi and Renninger, develops into maintained SI, this increase is an important first step to develop more stable individual interest.

Reading Fluency: Influences of Word Recognition and Comprehension
Keywords: Cognitive Development, Comprehension of Text and Graphics, Primary Education, Reading
Presenting Author: Luciana Vellinho Corso, Universidade Federal do Rio Grande do Sul (UFRGS), Brazil; **Co-Author:**Amanda Oliveira Meggiato, Universidade Federal do Rio Grande do Sul, Brazil; **Co-Author:**Helena Corso, Universidade Federal do Rio Grande do Sul, Brazil; **Co-Author:**RAQUEL WEBER, Universidade Federal do Rio Grande do Sul, Brazil; **Co-Author:**Fabiana de Miranda Rocha Luna, Universidade Federal do Rio Grande do Sul, Brazil

Reading involves word recognition, fluency, and comprehension. However, fluency has only recently been studied, and studies dealing with the relationship between fluency and other reading skills are scarce. Existing research also does not assess fluency dimensions (accuracy, automaticity, and prosody) in an integrated manner, and does not make clear whether fluency contributes to comprehension, or whether comprehension promotes fluency, or yet whether this relationship is reciprocal. This empirical research aimed to investigate the relationships between word recognition, fluency, and reading comprehension skills of Brazilian students in the 5th grade of elementary school. The participants were 57 students (M = 10.30, SD = 0.63 of age) from 5th grade of public schools. *Pearson* correlation analyses showed that skills are weakly to moderately correlated, with stronger correlations between prosody and comprehension (questionnaire) and between accuracy and comprehension (retelling). In the multiple regression analysis, fluency and word recognition explained 11% to 13% of the variance in comprehension, whereas the inverse, word recognition and comprehension explained 15 to 19% of the variance in fluency. The findings contribute to the development of more effective work with reading in the classroom and is fundamental to ensure the concomitant teaching of fluency and comprehension skills, since fluency can explain and be a product of proficient comprehension.

Reading achievement in a national university admission assessment: impact of motivation dimensions
Keywords: Achievement, Motivation, Reading, Self-efficacy
Presenting Author: Gabriela Gabriela Gómez, Universidad de O´Higgins, Chile; **Co-Author:**Marlene Rivas, Pontificia Universidad Católica de Chile, Chile

Several dimensions of motivation have been shown to impact reading performance. This proposal presents preliminary results of a national study searching to establish a relation between reading performance in a university access exam and non-cognitive dimensions related to reading motivation. 4945 candidates completed an on-line questionnaire after passing the admission reading test. The data was supplemented with official records about the test achievement, school, and individual socioeconomic characteristics. Using hierarchical linear models, we found a significant impact of the frequency of reading novels, journals

and newspapers, engagement in online social networks and webs about news and information. We also found a significant impact of the perception of vocabulary and text difficulty on the test. This study underlines that self-perception and reading habits have a role even in the contexts of a high stake test achievement.

Are speech sound difficulties a marker of difficulties in language and later reading skills?
Keywords: At-risk Students, Learning and Developmental Difficulties, Meta-analysis, Reading
Presenting Author: Line Walquist Sørli, UIT The Artctic University of Norway, Norway; **Co-Author:**Trude Nergard Nilssen, UiT The Arctic university of Norway, Norway; **Co-Author:**Monica Melby-Lervåg, University of Oslo, Norway; **Co-Author:**Bjarte Furnes, University of Bergen, Norway; **Co-Author:**Ømur Caglar-Ryeng, UiT The Arctic University of Norway, Norway

Abstract This systematic meta-analysis reviews 66 publications that have examined children with speech sound disorders and their skills in language and later reading. To be included in the review, the studies had to compare groups of children with and without speech sound difficulties in preschool age on language and/or later reading skills or be cross-sectional and longitudinal studies focusing on relationship between speech sound skills and language and/or reading. The studies were coded, and Hedges' g was calculated for group differences. For the studies with individual differences uncorrected bivariate Pearsons correlations were coded and transformed to Fishers z to adjust to a normal distribution. The result will be analysed with R package Robumeta and will be ready to present at the EARLY conference.

Do we understand the same when reading on tablets as we do on paper? A multilevel meta-analysis
Keywords: Comprehension of Text and Graphics, Educational Technologies, Meta-analysis, Reading
Presenting Author: Lidia Altamura García, University of Valencia, Spain; **Co-Author:**Anastasia Karagiorgi, Julius-Maximilians-Universität, Würzburg, Germany; **Co-Author:**Cristina Vargas, University of Valencia, Spain; **Co-Author:**Ladislao Salmerón, University of Valencia, Spain

Previous meta-analytic research has evidenced that readers tend to understand slightly worse when reading on-screen than when reading the same text in print. Because hand-held digital devices can offer a closer reading experience to print media, in this meta-analysis we aim to analyze the differences on reading comprehension when reading on tablets or e-readers, compared to print reading. Specifically, we aim to examine the differences between both hand-held devices, since e-readers are even closer to print-reading materials. Secondly, we will evaluate individual reader characteristics, such as the educational stage. A final selection of 29 studies (38 effect sizes), published between 2010 and 2022, were included in the analysis. Multilevel random-effects analysis were performed, the average effect size supported the prevalence of the "screen inferiority effect" (g = -.111, 95% CI: -.221, -.009; p = .033; k = 38, n= 29). This effect emerged, specially among university students. Moderator analysis regarding type of handheld device did not show significant differences. Methodological and educational implications are discussed.

Session I 22

24 August 2023 12:00 - 13:30
UOM_R03
Poster Presentation
Higher Education, Learning and Instructional Technology, Teaching and Teacher Education

Learning and Instructional Technologies

Keywords: Artificial Intelligence, Attitudes and Beliefs, Computational Thinking, Computer-assisted Learning, Educational Technologies, Emotion and Affect, Eye Tracking, Higher Education, In-service Teachers, Learning Analytics, Learning Strategies, Self-regulated Learning and Behaviour, Writing/Literacy
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 12 - Writing, SIG 16 - Metacognition and Self-Regulated Learning, SIG 27 - Online Measures of Learning Processes
Chairperson: David Corradi, University of Antwerp, Belgium

Promoting Effective Scaffolding for Self-Regulated Learning Strategies
Keywords: Computer-assisted Learning, Educational Technologies, Learning Analytics, Self-regulated Learning and Behaviour
Presenting Author: Tongguang Li, Monash University, Australia

Self-regulated learning (SRL) is a concept that describes how a learner controls, monitors, and regulates their learning process. Being able to effectively choose and use learning strategies and tactics in different learning contexts is crucial to becoming a skilled, self-regulated learner. Researchers aim to help learners improve their self-regulated learning and corresponding learning strategies and tactics by implementing learning analytics (LA), and academics have attempted to design LA-informed scaffolds and feedback targeting SRL and SRL strategies. However, previous studies have shown a lack of significant associations between scaffolding and learners' use of SRL strategies. This issue reflects how scaffolding could effectively facilitate and influence learners' SRL had not been adequately addressed in previous studies. As such, this doctoral proposal aims to fill the research gap by introducing and designing more effective and meaningful scaffolding targeting learners' SRL skills and their use of learning strategies and tactics. This research aims to address the current issue of scaffolding on SRL strategies by implementing state-of-the-art temporal and sequential analysis to identify learning signatures for each learner, which will reflect how learners use, regulate, and monitor their learning and their use of SRL strategies and tactics. Learning signatures will be used for identifying the learner's zone of proximal development (ZPD) in terms of SRL strategies. It is hypothesized that when the design and implementation of scaffolding is informed by the creation of learning signatures and by the identified ZPD, the scaffolding will become more adaptive and actionable to learners.

On the perception of social robots by higher education students
Keywords: Attitudes and Beliefs, Computational Thinking, Educational Technologies, Higher Education
Presenting Author: Josef Guggemos, University of Education Schwäbisch Gmünd, Germany; **Co-Author:**Stefan Sonderegger, University of St. Gallen, Switzerland; **Co-Author:**Sabine Seufert, University of St.Gallen, Switzerland

Social robots have the potential to play a vital role in education. For a successful adoption, technology acceptance may be necessary. Based on the ICAP framework, we have developed eight vignettes describing scenarios for the use of social robots in higher education, e.g., teaching assistant. Students in an introductory university course (N = 361) answered questions based on the unified-theory-of-acceptance-and-use-of-technology (UTAUT) as well as on their ethical approval. A confirmatory factor analysis showed that eight scenarios of robot use can be separated. A latent profile analysis identified four profiles. One profile is particularly noteworthy. It comprises students who accept social robots not as a means of instruction, e.g., as a tutor, but as a tool, e.g., to promote computational thinking.

Building Learning Theories with AI-Enhanced Conjectural Mapping
Keywords: Artificial Intelligence, Computer-assisted Learning, Educational Technologies, Learning Analytics
Presenting Author: Junsong Huang, National Institute of Education, Singapore; **Co-Author:**Susan Gwee, National Institute of Education/Nanyang Technological University, Singapore, Singapore; **Co-Author:**Jing Wu, National Institute of Education, Singapore; **Co-Author:**Simone Ann D Souza, National Institute of Education, Singapore

We propose to enhance conjecture mapping with Artificial Intelligence (AI) to make design-based research (DBR) more systematic and efficient in building learning theories. DBR seeks to simultaneously build learning theories and improve education practices through an iterative process of improving learning in authentic settings. To overcome methodological concerns on DBR, the conjecture mapping framework requires researchers to articulate explicitly the design and theoretical conjectures and to examine whether the desired learning outcomes can be traced back in the learning processes to designed elements. Because learning takes place in context-rich settings, systemically generating and testing all possible combinations of conjectures can be labor-intensive and inefficient, leading to slow progress in theory building. With the rise of AI-enabled adaptive learning systems (ALSs), we propose to enhance conjecture mapping research in two ways. First, applying machine learning on ALS-generated big data can significantly enrich the sources of conjectures. Pedagogical models of

ALSs can be further enhanced to allow systematic generation and rigorous testing of rich conjectures for discursive examination between learning theories and data-driven conjectures. Second, rigorous testing of conjectures can be conducted in ALS with AI-enhanced learner profiling, sampling, and learning analytics in real-time at the backend. Testing conjectures in ALS allows researchers to manipulate content and pedagogical approaches to create design experiments seamlessly with optimal use of samples. The proposed AI-enhanced conjecture mapping research not only contributes to the systematic and efficient building of learning theories but also reduces biases of AI for scalable adoption of ALSs to enhance learning practices.

SENSEitive Systems: Can physiological and eye-tracking data be indicators of learner emotions?
Keywords: Educational Technologies, Emotion and Affect, Eye Tracking, Learning Analytics
Presenting Author: Sharanya Lal, University of Twente, Netherlands; **Co-Author:**Tessa Eysink, University of Twente, Netherlands; **Co-Author:**Hannie Gijlers, University of Twente, Netherlands; **Co-Author:**Bernard Veldkamp, University of Twente, Netherlands; **Co-Author:**Willem Verwey, University of Twente, Netherlands

Emotions are a notable part of the learning experience. This in turn has a significant effect on learning outcomes. Therefore, it stands to reason that learners will benefit from digital learning systems that take their emotions into account. The prerequisite to this is a system's ability to detect emotions real-time, which may be made possible by sensors that continuously collect physiological and eye-tracking data. However, this is challenging because learning situations usually stimulate subtle emotions which may be difficult to detect. In this study, we investigated features derived from skin conductance, skin temperature, and eye movements that could be potential indicators of learner emotions. Forty-four university students completed three math related tasks during which sensor and self-reported data on the learner's emotional state were collected. Results indicate that skin conductance response peak count, saccade amplitude, fixation dispersion, and skin temperature are significant indicators of learner emotions. These features may be used to make learning systems more emotionally sensitive.

Long-term relations between teachers' attitudes towards technology and its use in the classroom
Keywords: Attitudes and Beliefs, Computer-assisted Learning, Educational Technologies, In-service Teachers
Presenting Author: Barbara Rončević Zubković, University of Rijeka, Faculty of Humanities and Social Sciences, Croatia; **Co-Author:**Rosanda Pahljina-Reinić, University of Rijeka, Faculty of Humanities and Social Sciences, Croatia; **Co-Author:**Martina Bažon, University of Rijeka, Faculty of Humanities and Social Sciences, Rijeka, Croatia; **Co-Author:**Svjetlana Kolić-Vehovec, University of Rijeka, Faculty of Humanities and Social Sciences, Croatia

In several theories and models on the adoption of modern technologies, attitudes are considered one of the main predictors of technology use, but the relationship between attitudes and digital technology use may even be reciprocal. However, longitudinal studies examining this relationship are scarce. Therefore, to investigate this assumed reciprocal relationship, the present study examined the longitudinal within-person dynamics of teachers' attitudes towards use of ICT (information and communication technologies) in teaching and learning (T&L) and their reported use of ICT-based teaching activities for students using a three-wave dataset gathered among 772 Croatian elementary and high school teachers and a random intercept cross-lagged panel model. This study was conducted as a part of a larger evaluation study examining the effects of the e-Schools project carried out by Croatian Academic and Research Network, with the aim of creating digitally mature schools in Croatia through the informatization of school operation and teaching processes. The results suggest that teachers' attitudes towards ICT use in T&L and the use of ICT-based teaching activities are jointly shaped by stable individual characteristics as well as situational factors. Some initial evidence for the expected reciprocal relationship between the perceived benefits of ICT use and the use of ICT-based teaching activities was provided, but no significant cross-lagged paths were identified for the perceived risks of ICT use and the use of ICT-based teaching activities. These findings provide an interesting point for further longitudinal examination of the relationship between teachers' attitudes and their use of ICT in the classroom.

Undergraduates' perceptions of an online training to integrate conflicting sources in writing
Keywords: Educational Technologies, Higher Education, Learning Strategies, Writing/Literacy
Presenting Author: Ruth Villalon, University of Cantabria, Spain; **Co-Author:**Maria Luna, Universidad a Distancia de Madrid (UDIMA), Spain; **Co-Author:**Isabel Martínez-Álvarez, Madrid Open University, Spain; **Co-Author:**Mar Mateos, Universidad Autónoma de Madrid, Spain

Integrating conflicting information from multiple sources is an essential skill in today's society. This ability can be developed in the field of education through tasks such as writing a synthesis after reading sources that present contradictory views about a topic. In this work, we focus on the design of an intervention on argumentative writing through the Moodle platform with students from an online university. The participants were 44 students of the Degrees of Psychology and Education. As an academic task, they were asked to write different syntheses after reading two sources presenting conflicting positions on various educational topics. Students received training about the processes involved on the synthesis task. The training includes different tools, using videos, graphic mediators and exercises, including an explicit instruction, as well as a modelling about the different phases of the synthesis writing process, focusing especially on integration. In this work we present, on the one hand, the particularities of the intervention and, on the other, the perception of the participants in terms of: (1) the degree of improvement in their skills, (2) the usefulness of the aid received and (3) their degree of satisfaction with the intervention. The results show that, in general, students consider that their skills have improved significantly and that the aids provided have been effective. In addition, their satisfaction with the intervention is high.

Session I 23

24 August 2023 12:00 - 13:30
UOM_GYM
Roundtable
Teaching and Teacher Education

Mentoring and Coaching

Keywords: Competencies, Higher Education, Mentoring and Coaching, Mixed-method Research, Pre-service Teachers, Primary Education, Qualitative Methods, Resilience, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development
Chairperson: Athanasios Verdis, National and Kapodistrian University of Athens, Greece

Internships and its influence on self-assessed competences of teacher students
Keywords: Competencies, Mentoring and Coaching, Mixed-method Research, Teacher Professional Development
Presenting Author: Carina Caruso, University of Paderborn, Germany

A lot of research on teachers' professional development focuses on formal learning in educational institutions. Competence-based teacher training raises questions for empirical research particularly regarding the impact of internships and practical phases as regular parts of study programmes: At the same time, many teacher education programmes nowadays implemented long-term internships. The main purpose of these internships aims at the development of competencies and skills through practical experience. This contribution discusses (1) challenges and potentials of learning in practice as well as (2) exemplary findings of a mixed-methods study that investigates the development of self-perceived didactic competencies and skills of teacher students during a long-term internship (5 months) in a German teacher education master programme. The results reveal in which didactic fields the students improved during the internship and in which they did not.

An exploratory study: perspectives of mentors on longterm internships at school
Keywords: Competencies, Mentoring and Coaching, Qualitative Methods, Teacher Professional Development
Presenting Author: Carina Caruso, University of Paderborn, Germany; **Co-Author:**Michael Goller, Educational Science Institute (University of Paderborn), Germany

Internships are an important part of many teacher education programmes around the world. From a theoretical perspective, such internships aim at student teachers' development of competencies by experiential learning through the engagement in school practice as well as by relating those practice-based experience with theoretical and conceptual knowledge learned at university (e.g., Allen & Wright, 2014). Within the literature, mentors—that is, more experienced teachers that support, coach, and evaluate student teachers (e.g., Wang, 2018)—have been emphasised to play an important role in these development processes. In fact, without the guidance of more experienced practitioners, student teachers quickly lose themselves in the complexity of pedagogical situations, are incapable to recognize and interpret what is going on in schools, as well as are unable to reflect their experiences theoretically (Berliner, 2001). And although the importance of mentors have often been acknowledged almost nothing is known about the mentors' perspective on student teachers' internships as well as on the development processes they are supposed to support and supervise. The aim of this contribution is close this research gap. Based on an interview study with 23 experienced teachers that regularly serve as mentors during internships the following research questions will be answered: (a) What professional goals do mentors attribute students' teacher internships and how do they try to meet those goals? (b) What challenges do mentors face during their mentorship practice in the context of internships?

Second career teachers to the rescue? New insights on the development of their teaching skills
Keywords: Higher Education, Mentoring and Coaching, Pre-service Teachers, Primary Education
Presenting Author: Tamar Tas, Universiteit Utrecht / Hogeschool Utrecht, Netherlands; **Co-Author:**Saskia Brokamp, Utrecht University of Applied Sciences, Netherlands; **Co-Author:**Mieke Koeslag-Kreunen, Universiteit Utrecht / Hogeschool Utrecht, Netherlands

The immediate employment of second career teachers is seen as a solution for the increasing shortage of teachers in the Netherlands. This group with a prior academic degree starts teaching right away, while simultaneously studying to obtain a degree in teaching. This work/study combination is well known for its extreme workload and high dropout rate. Surprisingly, little is known about the process of learning to teach and the development of effective teaching skills of this specific group of teacher trainees.
At a teacher training college in a large urban area an effective developmentally appropriate coaching approach is used to align theory taught on effective teaching skills (proven to achieve maximum learning gains in children) with practice in elementary schools. This study researches how the teaching skills of second career teachers trained with this coaching approach develop. Furthermore, it studies whether there are differences in the way these skills develop, compared to those of other types of student teachers (i.e., part-time, or regular student teachers).
Using a paired t-test, the average growth of teaching skills of second career teachers (n=30) trained with the developmentally appropriate coaching indicates to be large (in effect sizes) on all six scales of the ICALT-observation-instrument. Yet, the growth of teaching skills of regular student teachers measured (n=159) is medium.
These insights can be used to further match training programs to the needs of second career teachers to become good teachers in the briefest possible time span.

Enabling Emerging Teacher Resilience through Reflective Writing
Keywords: Mentoring and Coaching, Pre-service Teachers, Qualitative Methods, Resilience
Presenting Author: Mikko Tiilikainen, University of Turku, Finland; **Co-Author:**Olli-Pekka Heinimäki, University of Turku, Finland; **Co-Author:**Janne Lepola, Univ. of Turku, Finland; **Co-Author:**Anu Kajamies, University of Turku, Finland

The purpose of this roundtable presentation is to discuss work in progress where we use systematic written reflection to study and support emerging teacher resilience in the context of teaching practice. Based on previous studies, teacher resilience is understood as a positive and functional adaptation process taking place when teachers deal with critical events in their teaching. Studies that aim to connect teacher resilience to instructional core practices – pedagogical, curricular, and didactical encounters in teaching – are lacking. Also, tools to promote resilience during teacher education remain scarce. Drawing on developments in parallel fields, especially in psychotherapeutic research, we suggest that emerging teacher resilience could be supported through carefully supervised written reflection practices. The empirical part of the study is based on systematically guided written portfolios that were collected from 32 student teachers during their second teaching practicum. The portfolio reflection focused on critical – empowering and challenging – teaching incidents that student teachers selected from their teaching practice. In-depth qualitative data are analyzed abductively using three lenses: How student teachers deal with a) instructional core relations, b) potential and actual adversity, and c) positive adaptation in their reflective episodes. The study constructs a theoretical framework for emerging teacher resilience as a transactional experience-reflection -process. Uncovered qualities of student teachers' reflection can be used to develop reflective practices in teacher education. The study provides a realistic and practice-based tool to promote emerging teacher resilience by modifying widely used practicum portfolio assignments.

Session I 24

24 August 2023 12:00 - 13:30
UOM_R08
Workshop
Teaching and Teacher Education

FLORERAAR?! A board-game to enhance (pre-service) teachers' resilience

Keywords: Game-based Learning, Pre-service Teachers, Resilience, Well-being
Interest group: SIG 11 - Teaching and Teacher Education

Resilience is an important factor that helps teachers deal with the challenges they encounter. But how, in teacher education, can we already address the topic of resilience? We developed an educational board game 'FLORERAAR?! that focuses on making (future) teachers more aware of their own resilience and how to develop their resilience. The board game addresses five different themes: understanding resilience, enhancing your social-network, the importance of well-being and self-care, taking initiative in your own professional development and emotion regulation before, during and after teaching. In our workshop, we would like to introduce the board game and focus on two aspects: experiencing what it is like to play the board game and discover how as an educator you might use this game in your own programme. For the first part, the main goal is for participants to become aware of the importance of resilience and know what resources and strategies they can use to increase their resilience. After a short introduction, participants will start working with the theme of resilience in a creative and educational way by playing the board game in small groups. The board game will help participants think about their own resilience while sharing experiences with each other. During the second part of the workshop, we would like to discuss our experiences of using the board game with both students and teacher educators in our own teaching programme, and talk about how the board game can be used in participants own contexts.

FLORERAAR?! A board-game to enhance (pre-service) teachers' resilience
Presenting Author: Marjon Fokkens-Bruinsma, University of Groningen, Netherlands; **Co-Author:**Irene Poort, University of Groningen, Netherlands; **Co-Author:**Saskia Tuenter, University of Groningen, Netherlands; **Co-Author:**Michelle Gemmink, University of Groningen / Katholieke Pabo Zwolle, Netherlands

Resilience is an important factor that helps teachers deal with the challenges they encounter. But how, in teacher education, can we already address the topic of resilience? We developed an educational board game 'FLORERAAR?! that focuses on making (future) teachers more aware of their own resilience and how to develop their resilience. The board game addresses five different themes: understanding resilience, enhancing your social-network, the importance of well-being and self-care, taking initiative in your own professional development and emotion regulation before, during and after teaching. In our workshop, we would like to introduce the board game and focus on two aspects: experiencing what it is like to play the board game and discover how as an educator you might use this game in your own programme. For the first part, the main goal is for participants to become aware of the importance of resilience and know what resources and strategies they can use to increase their resilience. After a short introduction, participants will start working with the theme of resilience in a creative and educational way by playing the board game in small groups. The board game will help participants think about their own resilience while sharing experiences with each other. During the second part of the workshop, we would like to discuss our experiences of using the board game with both students and teacher

educators in our own teaching programme, and talk about how the board game can be used in participants own contexts.

Session I 25

24 August 2023 12:00 - 13:30
UOM_A10
ICT Demonstration
Learning and Social Interaction

Designing technology to support multimodal dialogue and participation: the third generation Talkwall

Keywords: Computer-supported Collaborative Learning, Dialogic Pedagogy, Educational Technologies, Social Interaction
Interest group: SIG 10 - Social Interaction in Learning and Instruction

Please bring your own device if you are attending this ICT demonstration.Aligned with an appropriate pedagogy, dialogue and digital technology can interact to enhance learning in various ways (Major et al., 2018). This demonstration will introduce participants to Talkwall, a free-to-access, cloud-based micro-blogging platform that has been developed through a process of systematic design-based research over the past decade. Talkwall has been designed to encourage students to engage and share their developing ideas, support multimodal dialogic interaction and promote student participation. Participants can use their own mobile/computing devices to experience Talkwall. They will also be introduced to concrete examples of Talkwall-supported dialogic lesson designs, including teacher and student support materials. During the session, the intention is to build on the attendees' rich experience using related pedagogical and technological designs, and audience comments will be collated using Talkwall. Finally, options for future large-scale deployment will be explored. Please note, this demonstration does not require participants to sign up to be able to use Talkwall. Additionally, there is no need for participants to install any software, as the system is accessible through standard web browsers available on PCs, smartphones and tablets. Talkwall is freely available in English and Norwegian at www.talkwall.uio.no .

Designing technology to support multimodal dialogue and participation: the third generation Talkwall
Presenting Author: Ingvill Rasmussen, University of Oslo, Norway; **Presenting Author:**Louis Major, University of Manchester, United Kingdom; **Co-Author:**Anja Amundrud, University of Oslo, Norway; **Co-Author:**Kari Anne Rødnes, University of Oslo, Norway; **Co-Author:**Jo Inge Johansen Frøytlog, University of South-Eastern Norway, Norway; **Co-Author:**Ole Smørdal, University of Oslo, Norway; **Co-Author:**Maren Omland, OsloMet, Norway

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Session J 1

24 August 2023 14:45 - 16:15
UOM_A03
Invited Symposium
Learning and Social Interaction

Aesthetic experience as a tool for learning and development

Keywords: Art Education, At-risk Students, Competencies, Cooperative/Collaborative Learning, Creativity/Divergent Thinking, Developmental Processes, Digital Literacy and Learning, Emotion and Affect, Engagement, Higher Education, Inclusive Education, Lifelong Learning, Qualitative Methods
Interest group: SIG 10 - Social Interaction in Learning and Instruction
Chairperson: Laure KLOETZER, Switzerland
Discussant: Antonio Iannaccone, University of Neuchâtel, Switzerland

This invited symposium of SIG 10 builds on previous discussions at EARLI conferences on arts-based methodologies and social interactions for learning and development. In this symposium, we will focus on aesthetics as a tool and trigger for learning and development, through an analysis of the social interactions at play. The symposium discusses the following questions:How can the concept of aesthetic experience be useful to understand learning and developmental dynamics in diverse projects?How is the aesthetic experience of the participants being used in these projects, and what are the results of this?What are the institutional and curricular implications of these pedagogical investigations into the field of aesthetics?The four papers will define aesthetic experience and operationalise it in specific contexts. The first paper (Italy) reports on a long-term experience of intervention with arts-based projects for teenagers who have dropped out of school. The second paper (USA) analyzes choice poetics in a interactive digital narratives workshop as a space for the intersubjective construction of culturally-diverse university students. The third paper (Switzerland) investigates multimodality as semiotisation of the aesthetic experience in undergraduate and graduate university courses in Switzerland. The fourth paper (France) explores the developmental dynamics of the use of arts as a way to reflect on and express one's professional career in a program for professionals transitioning to retirement.

"SIC EST": THE ARTEDUCATION OF MAESTRI DI STRADA VIDEO-NARRATED BY A GROUP OF ADOLESCENTES
Presenting Author:ELISABETTA FENIZIA, University of Naples Federico II, Italy; **Co-Author:**Filomena Carillo, Non-profit Association Maestri di Strada, Italy; **Co-Author:**Santa Parello, University Federico II of Naples, Italy

Italy is among the European countries with the highest school drop-out rates. It is well known that extra-curricular activities can foster dropout recovery, strengthening engagement and social ties. The non-profit Association Maestri di Strada (MdS) carries out educational projects in the suburbs of Naples to combat educational wastage, social marginality and deviance, using arteducation and storytelling as devices. MdS organises theatre, music and visual arts workshops, in which around 100 adolescents at psycho-social risk participate every year. Art and beauty enable adolescents who experience school and their neighbourhood as a senseless and painful experience to feel that they are the subjects of their own growth in a shifted and protected space, where they can mend their ties with society. This contribution presents the stages of a work aimed at documenting, narrating and evaluating the art workshops in terms of their impact on the development of a group of adolescents. It was in itself a process of shared artistic creation. In a first step, focused video-recorded narrative interviews were conducted with 13 adolescents who took part in the workshops. From this corpus, subjected to categorical analysis, 5 macro-themes emerged: Outer and Inner Suburbs - Street School - Ties and 'heavy blows' - Arts and Crafts: turning pain into beauty - Sic Est: the time for storytelling. Starting from these macro-themes, a documentary film, *Sic Est*, was elaborated and edited, which was finally presented to the local educational community and to several social film festivals, where it received positive feedback and awards.

Semiotising the aesthetic experience in education: multimodality in students' diaries
Presenting Author: Ramiro Tau, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland; **Co-Author:**Laure KLOETZER, Institute of Psychology & Education, University of Neuchâtel, Switzerland

In this paper, we investigate the contribution of aesthetic experience to learning in Higher Education, based on the analysis of three university courses making

use of performing arts as a pedagogical tool. The two problems we will address are: what is an aesthetic experience for the students, and what are their potential benefits. Personal diaries and students' final reports were used as an instrument for reflecting on the experience of the course. Using a qualitative analysis of content of these diaries, we explore different dimensions of the educational experience. One of the distinctive features of these diaries is their multimodality. Indeed, they do not contain exclusively narrative textual content, but also poetry, textures, collages, drawings, small objects, images, references to music and online audio-visual materials, etc. The richness of multimodality seems to account for a quest to semiotise the students' experience, that is highly ineffable. We will show examples of these uses and identify three uses of multimodality: a) as a strategy to render the aesthetic experience intelligible and circumscribe it, b) as a resource to account for the inseparability between intellectual understanding and aesthetic experience, c) as a resource to become aware of an essentially aesthetic activity. From these results we will try to contribute with empirical evidence to a non-dichotomous semiotic and axiological aesthetics for learning sciences, and we intend to contribute to the field of curriculum design by offering elements to consider the aesthetic possibilities offered by multimodality especially in the field of course assessment.

Choice Poetics in Interactive Digital Narrative Design Learning
Presenting Author: Yasmeen ElGerbi, CUNY Graduate Center, Libya; **Co-Author:**Colette Daiute, The Graduate Center, CUNY, United States; **Co-Author:**John T. Murray, CUNY Graduate Center, United States

This paper explores tensions between learning to use a digital tool for creating a new type of collaborative narrative and *un*learning more familiar individualistic narrative genre. With a secondary analysis of interactive digital narratives (IDN) by undergraduates new to IDN (Daiute, Murray, Wright, and Calistro, 2022), we explored how students used the choice tool to offer their players narrative co-authoring. We extended choice poetics theory (Mawhorter, Mateas, Wardrip-Fruin, 2015) to examine whether and how student designers offered their players choices for creative engagement in the IDN process. The 64 participants learned the choice/branching function, indicated by their introduction of 273 choices for players to apply across four design-play turns. In addition to the conceptual quality of each choice (trait, adventure, socioemotional, moral), we noticed how choices affected the storyline. Designer-focused options allowed the player to make selections tightly integrated into the designer storyline, whereas player-engaged options required the player to make decisions that would alter the narrative trajectory. Those player-engaged choices allowed for different possible storylines, requiring the player to make decisions about character development, social issue, or moral implications thereby embarking on relevant other choices, such as in one design a predictable yet happy path through marriage or an uncertain career path; and in another design and adventurous romp or a soul-searching inner dialogue. Because choice functions engaged players more or less collaboratively, they manifest the rather difficult shift from what scholars refer to as legacy narrating (Koenitz, 2015) to this novel aesthetic interactive digital narrating.

Learning from one's own aesthetic inner world: aesthetics as a modality of language
Presenting Author: Maurin Coralie, Institut National de la Recherche pour l'Agriculture et L'Environnement, France

In this presentation, I will discuss the exploration of one's aesthetic experience (Dewey, 1933) as a way of exploring the meaning of one's life/work experience and as a way of learning from it (Schaefer, 2015). I will first present the core principles of the design of a professional support programme offered to employees transitioning to retirement at the National Institute for Agricultural and Environmental Research (Auricoste et al. 2019; Maurin et al. 2020; Maurin, 2022). I will then show how aesthetics - when language is considered as a multimodal medium (De Saint Georges, 2003) to shape and restore one's experience (Varela, 1983; Eschenauer, 2019) - is one of the linguistic modalities that helps to connect with layers of meaning that are difficult to access through verbalisation alone. Finally, I will use two case studies to discuss the potential for learning from the process on the part of participants and those who accompany them.

Session J 2

24 August 2023 14:45 - 16:15
AUTH_CH
Invited Panel

Supporting Researchers at risk: the key role of European Academia

Keywords: Citizenship Education, Educational Policy, Inclusive Education, Social Aspects of Learning and Teaching
Interest group:
Chairperson: Ioanna Kostarella, Aristotle University of Thessaloniki, Greece

Academic freedom and freedom of scientific research are considered core principles for scientific progress; however, in many countries around the world academics face risks to their life, liberty, and research careers due to discrimination, persecution, disaster, violence or war. When researchers are at risk, and excluded from participating in the global research circuit, not only are individual lives and careers at risk; the very future of research is also at stake.
The session aims to raise awareness on academic freedom challenges and promote active involvement in the support of academics at risk, not only as a manifestation of solidarity and defense of human rights, but also as a means to enrich research in European institutions, as the skills and attributes of at-risk researchers can carry significant research potential for hosting countries in Europe. Furthermore, the session aims to foster exchange on challenges, good practices, expectations and experiences with regard to supporting researchers at risk. - The Global Scholars at Risk Network and the *Inspireurope: Supporting Researchers at Risk* Initiative
Joel Hanisek, SAR Europe, Maynooth University, Ireland;

- Academic freedom and inclusion of at-risk researchers
Andreas Takis, Aristotle University of Thessaloniki, Greece

- Funding opportunities for scholars at risk
Frank Albrecht, Alexander von Humboldt Foundation, Germany

- Guidelines for successful hosting
Malamati Tsapoutzoglou, Aristotle University of Thessaloniki, Greece

The importance of academic mentoring; a scholar's experience
Yudit Namer, University of Twente, Netherlands

Supporting Researchers at risk: the key role of European Academia
Presenting Author: Joel Hanisek, SAR Europe, Maynooth University, Ireland; **Presenting Author:**Andreas Takis, Aristotle University of Thessaloniki, Greece; **Presenting Author:**Frank Albrecht, Alexander von Humboldt Foundation, Germany; **Presenting Author:**Malamati Tsapoutzoglou, Aristotle University of Thessaloniki, Greece; **Presenting Author:**Yudit Namer, University of Twente, Netherlands

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The importance of academic mentoring; a scholar's experience
Yudit Namer, University of Twente, Netherlands

Session J 3

24 August 2023 14:45 - 16:15
HELEXPO_CC
Invited Symposium
Cognitive Science, Educational Policy and Systems

Contributions of Greek psychological research in Education

Keywords: Attitudes and Beliefs, Cognitive Development, Cognitive Skills and Processes, Conceptual Change, Developmental Processes, Engagement, In-service Teachers, Pre-service Teachers, Quantitative Methods, Resilience, Self-regulated Learning and Behaviour, Special Education, Teacher Effectiveness, Teacher Professional Development
Interest group:
Chairperson: NIKOLAOS MAKRIS, Democritus University of Thrace, Greece
Organiser: - Hellenic Psychological Society, Greece
Discussant: NIKOLAOS MAKRIS, Democritus University of Thrace, Greece

Education is a dynamic field where several factors are continuously interacting to promote effective teaching and learning. Predominant, among these factors, are teachers' individual characteristics, such as their own flexibility and adjustment to the demands of their profession, personal beliefs about learning and teaching, but also students' features, like their cognitive skills and competences, which may facilitate or impede learning in various school subjects. The symposium presents four studies demonstrating the current interests of Greek psychological research in education. Daniilidou and Platsidou's study present a new scale addressing teachers' resilience that takes into account personal and environmental protective factors, like values and beliefs, emotional adequacy, relationships within and outside the school environment and the legislative framework of education. Based on the argument that teachers' beliefs affect their teaching practices and students' school adjustment, Karakasidou et al. present a study on teachers' beliefs about their efficacy in supporting children with special needs. Karousou et al. present a study regarding the effects that various cognitive factors, such as executive functions, metalinguistic awareness and theory of mind, have on narrative competence among children of pre-school and school age. Kyriakopoulou and Skopeliti, on the basis of the framework theory approach on conceptual change, present a study on pre-service teachers' epistemic beliefs and their relation to their beliefs of learning and educational practices. The theoretical and practical implications of the studies are discussed. Proposals for developing educational policy are also made.

TPFRS: A new measure for assessing resilience in teachers
Presenting Author: Athena Daniilidou, University of Macedonia, Greece; **Co-Author:**Maria Platsidou, University of Macedonia, Greece

Recently developed scales addressed -specifically- to teachers' resilience, although profited the field, they do not include some of the critical protective factors of teachers' resilience identified in the literature. To address this limitation, we aimed at designing a more comprehensive scale for measuring teachers' resilience which encompasses personal and environmental protective factors. To this end, two studies were carried out. In Study 1, 407 primary school teachers were tested with the new scale named Teachers' Protective Factors of Resilience Scale (TPFRS). The Multidimensional Teachers' Resilience Scale (Mansfield & Wosnitza, 2015) and the Teachers' Resilience Scale (Daniilidou & Platsidou, 2018) were used to test the convergent validity, while the Maslach Burnout Inventory (Maslach & Jackson, 1986) and the Teachers' Sense of Efficacy Scale (Tchannen-Moran & Woolfolk Hoy, 2001) were used to assess the discriminant validity of the new scale. Data analysis performed by confirmatory factor analysis and item response theory analysis revealed that the TPFRS includes 29 items, which assess three personal and three environmental protective factors of teachers' resilience, and it presents a satisfactory discriminant validity. Study 2, in which 964 primary and secondary school teachers were tested, confirmed the factorial structure of the TPFRS as well as its discriminant validity which was tested with the Schutte Emotional Intelligence Scale-Short Form (Diamantopoulou & Platsidou, 2019). In conclusion, our results confirmed that the TPFRS is a valid instrument for assessing teachers' protective factors of resilience and it can be safely used in future research and interventions in the teaching profession.

What do Greek teachers need to better support students with special learning needs?
Presenting Author: Eirini Karakasidou, Panteion University of Social and Political Sciences, Greece; **Co-Author:**Olga Lainidi, University of Leeds, United Kingdom; **Co-Author:**Anastassios Stalikas, Panteion University, Greece

The aim of the current study was to explore the perceptions and educational needs of secondary education teachers regarding their preparedness to support students with Special Learning Needs (SLNs) in Greece. A quantitative cross-sectional study was carried out and data were collected using a structured questionnaire consisting of closed questions (N=103, 82.5% women). The results of the study indicated that having attended additional training in SNLs has a significant effect on participants' perceptions of their knowledge and adequacy to support students with SNLs. Most of the participants highly agreed with the need to have additional training programs related to SNLs, because they will allow them to specialise in SNLs and respond to the increasing numbers of students with SNLs. The study highlighted the need for trainings that connect theory with practice and employ contemporary teaching methods. The educational system needs to address this gap in teacher training, especially as secondary education teachers do not undergo mandatory training in SNL pedagogy as part of the undergraduate education. Including teachers' voices in the design and implementation of these training can be critical both for increasing teacher participation but also for ensuring that the skills teachers obtain can be transferred in the classroom.

The combined effect of cognitive factors on preprimary and primary school students' narrative skills
Presenting Author: Alexandra Karousou, Democritus University of Thrace, Greece; **Co-Author:**Dimitra Oikonomakou, Democritus University of Thrace, Greece; **Co-Author:**Smaragda Kazi, Panteion University of Social and Political Sciences, Greece; **Co-Author:**Tryfonas Bikos, Democritus University of Thrace, Greece

The ability to produce a meaningful, coherent and cohesive account of a series of events is a complex skill that develops gradually through the school years and is shown to be related to academic success. Recent research confirmed a relationship between students' narrative skills and several cognitive processes (e.g., executive functions, metalinguistic awareness, Theory of Mind). Nonetheless, available research is limited to studying the effect of these factors independently, while focusing each time on very restricted developmental periods. To our knowledge, there has been no unitary account of the complex ways these parallel developments interact to affect children's narratives. The present study aimed to measure various cognitive factors hypothesized to affect oral narrative skills and uncover the combined effect of these factors on narrative competence at different ages. A sample of 293 students aged 4-12 years was tested with an extensive battery of tasks, assessing: oral narrative skills, language skills, verbal fluency, executive functions, metalinguistic awareness, and Theory of Mind. Regression and path analysis models illustrated the complex interactions and interconnections among the factors studied, as well as their effect on children's

narrative competence. Direct and indirect effects were confirmed between linguistic competence and narrative skills. These were mediated, to a lesser or greater extent, by different cognitive processes and skills depending on the children's age. Results are discussed for their theoretical implications, as well as their potential applications in the design of interventions to enhance narrative competence. *Research supported by the "Hellenic Foundation for Research and Innovation" (Project:FM17-13).

Preservice teachers' epistemic and educational beliefs on their educational practices
Presenting Author: Anastasia/Natassa Kyriakopoulou, National & Kapodistrian University of Athens, Greece; **Co-Author:**Irini Skopeliti, University of Patras, Greece

Which are pre-service teachers' beliefs about learning, self-regulated learning, teaching and mode of engagement? Are these beliefs influenced from pre-service teachers' epistemic beliefs? How do these two belief systems interact during the educational practice? Two-hundred and thirty-two pre-service teachers were administered (a) a questionnaire investigating their epistemic beliefs, (b) a questionnaire investigating their beliefs about learning, self-regulated learning and teaching, (c) a questionnaire investigating their beliefs about specific teaching practices and students' cognitive engagement in the learning process, and (d) four teaching scenarios based on four modes of cognitive engagement. We expected that pre-service teachers will hold beliefs about learning and teaching that may be both consistent and inconsistent with more constructivist and student-centered approaches to learning. Additionally, we hypothesized high correlations between their epistemic beliefs, their beliefs about learning and teaching and their educational practices. The results confirmed our hypotheses and indicated that preservice teacher's epistemic beliefs had a direct impact on their beliefs about teaching and learning and on their educational practices. An indirect impact of their epistemic beliefs through educational beliefs was also found on their educational practices. The findings will be discussed in light of the framework theory approach on conceptual change and their implication for pre-service te

Session J 4

24 August 2023 14:45 - 16:15
UOM_CH
Invited Symposium
Higher Education

Improving university teaching through teachers' professional learning and development

Keywords: Higher Education, Learning Approaches, Teacher Professional Development, Teaching Approaches
Interest group: SIG 04 - Higher Education
Chairperson: Jan Vermunt, Eindhoven University of Technology, Netherlands
Organiser: Perry den Brok, Eindhoven University of Technology, Netherlands
Organiser: Frans Prins, Utrecht University, Netherlands
Discussant: Vincent Donche, University of Antwerp, Belgium

Many universities nowadays are experimenting with new ways to improve the quality of their teaching, teachers and students' learning. Often these improvements have in common that they are aimed at fostering more active, self-regulated, collaborative, deep and application-oriented student learning. These innovations require quite different teacher roles and skills than many lecturers are familiar with. Unfortunately, research on teacher professional learning and development (PLD) in higher education is still in its infancy. A wide variety of professional development initiatives is being practiced, but a solid research base founded on research about whether, how and why different approaches work in different contexts is lacking. Moreover, research on teacher PLD is often disconnected from research on student learning.The scientific aim of this symposium is to increase our understanding of whether, why and how different approaches to PLD work for different populations and contexts. The four papers report on research in different countries: Romania, Finland and The Netherlands. They employ a variety of quantitative and qualitative research methodologies. Most importantly, the papers report on research on different pedagogical approaches to teacher PLD. They not only consider the effects of professional development programs on teacher learning outcomes, but also look into the processes of teachers' learning. Finally, the papers aim to increase our understanding of the impact of PLD on teachers' teaching practices. The educational relevance of the symposium lies in the provision of new knowledge that universities can use to improve the quality of their teaching, teachers and students' learning.

Academics' pedagogical training: Effects on teachers and students' outcomes, a multilevel analysis
Presenting Author: Marian Ilie, West University of Timisoara, Romania; **Co-Author:**Jan Vermunt, Eindhoven University of Technology, Netherlands; **Co-Author:**Velibor Mladenovici, West University of Timisoara, Romania; **Co-Author:**Zselyke Pap, Department of Psychology, West University of Timișoara, Romania; **Co-Author:**Laurențiu P. Maricuțoiu, Center for Academic Development and Department of Psychology, West University of Timișoara, Romania

Between July 2018 and July 2021, academics from five Romanian universities participated in three 15 ECTS pedagogical programs. The main purpose of these programs was to change academics' teaching towards a learning-centered approach to teaching. Excepting the specific contents of each program (i.e., P1 – general principles and methods for teaching in higher education; P2 – Maastricht University model of Problem-Based Learning and P3 – evidence-based teaching in higher education), all programs had the same structure (i.e., 150 hours, of which 40 hours theoretical courses, 80 hours practical applications, and 30 hours peer to peer observation and group reflection).To evaluate the programs' effect, we collected data, in four waves with six months between, about participants' perception of the quality and usefulness of the programs, academics' teaching approaches, students' perception of the teachers' classroom behavior, and students' learning approaches. For data analysis, students' answers were aggregated at the teacher level.The programs sustained academics in adopting more positive approaches to teaching especially by decreasing their teacher-centered intentions and related strategies. Students' deep approach has been significantly and positively linked to *challenging beliefs* and *motivation* as teachers' classroom behaviors. The surface approach has been significantly and negatively related to *understanding the fundamental concepts, relevance, organization, and flexibility*while positively associated with *teacher-student relationships*. Also, it seems that students in classes taught by older male professors have adopted a deeper approach to learning. Generally, the data highlight that the training programs achieved the objectives proposed.

How does developing an innovation as part of a PDI impact mid-career teachers' learning?
Presenting Author: Indira Day, Utrecht University, Netherlands; **Co-Author:**Tim Stevens, Eindhoven University of Technology, Netherlands; **Co-Author:**Frans Prins, Utrecht University, Netherlands; **Co-Author:**Perry den Brok, Eindhoven University of Technology, Netherlands; **Co-Author:**Jan Vermunt, Eindhoven University of Technology, Netherlands

Higher education teachers need professional learning and development to be able to adapt to or design educational innovations. However, it is currently unclear how professional development initiatives (PDI's) in the context of educational innovation should be designed to make a meaningful impact on teacher learning. To further this knowledge, the current study investigates two PDI's where teachers design an educational innovation. These PDI's are well-established programmes for the professional development of mid-career teachers, but are usually not evaluated on the interplay between innovation and professional development. This study aims to further investigate this interplay by interviewing participants and facilitators of the two PDI's. Interview questions focus on teachers' and facilitators' perspectives on effective facets of the programmes, as well as critical learning moments for the teachers. Preliminary findings show similarities in general programme design between the two PDI's, both last 18 months, have a few communal meetings, and focus on exchange between peers. Teachers had designed a variety of innovations. Interviews with the course facilitators of programme 1 showed that throughout the years there have been clear "general themes" in innovations, where a majority of teachers wanted to focus on a specific innovation. Facilitators noted that teachers' learning goals often got more specific throughout the programme, following teachers' increased knowledge about educational sciences. Critical learning moments are currently being analysed. Tentatively, peer exchange seems to be an important factor. This study will provide evidence-informed guidelines for PDI design.

HE pedagogy developers' regulation skills and ways to develop their own pedagogical expertise
Presenting Author: Mari Murtonen, University of Turku, Finland; **Co-Author:**Henna Virtanen, University of Turku, Finland; **Co-Author:**Henna Vilppu, University

of Turku, Finland

This study looks at Finnish higher education pedagogical developers' own readiness for pedagogical development and how it connects to the actual ways to develop their pedagogical expertise. The readiness for pedagogical development consisted of their regulation skills, appreciating collegiality, prioritizing work time for pedagogical development and nativist conceptions of teacher ability. The actual practices included, for example, taking part in pedagogical development groups at my own work community, which was the most common activity, and participating by writing pedagogical texts for science community, which was the least common practice. Two groups were constituted based on their differences in their readiness for pedagogical development. These groups had significant differences in their concrete actions to develop their own pedagogical expertise, such as, reading pedagogical literature, participating in short pedagogical trainings, and participating in pedagogical developmental networks.

Supporting teachers' learning in the context of self-initiated educational innovations: what works?
Presenting Author: Tim Stevens, Eindhoven University of Technology, Netherlands; **Co-Author:**Remco Coppoolse, Utrecht University of applied science, Netherlands; **Co-Author:**Roeland M. Van der Rijst, ICLON-Leiden University Graduate School of Teaching, Netherlands; **Co-Author:**Arjen de Vetten, VU University Amsterdam, Netherlands; **Co-Author:**Indira Day, Utrecht University, Netherlands; **Co-Author:**Perry den Brok, Eindhoven University of Technology, Netherlands; **Co-Author:**Frans Prins, Utrecht University, Netherlands; **Co-Author:**Jan Vermunt, Eindhoven University of Technology, Netherlands

Research on teacher professional learning and development (PLD) in the context of innovation in higher education (HE) tends to focus on the impact of PLD programmes on teachers' implementation of a predefined educational innovation. However, little is known about the learning of teachers in programmes that stimulate teachers to develop, implement and evaluate educational innovations themselves, such as in innovation fund programmes. These programmes often involve peer consultancy to enhance teacher PLD and the quality of educational innovations, but little is known about why and how teachers in these programmes can best be supported. In order to better understand how key features of the programme influence the learning process of teachers and their impact on education and students, this study investigates two programmes in The Netherlands: a 'teacher academy' at a university, and a 'knowledge platform' for teachers from different universities. In both cases, six teachers are interviewed for an in-depth inquiry about their learning process, and interviews with PD facilitators and secondary data is used for triangulation. The preliminary results indicate that a critical element for teacher learning and successful innovation is the alignment of the teachers' personal learning goals with the collective learning and the organisational learning beyond the programme. A plea is made to move from outcome-oriented approaches in teacher PLD programmes and educational innovation programmes, to a process-oriented approach that connects teachers' research-based learning with evidence-informed innovation. This can enhance the sense of ownership among teachers and support the development of appropriate innovations.

Session J 5

24 August 2023 14:45 - 16:15
AUTH_DC2
Symposium
Teaching and Teacher Education

Understanding and Developing Teacher Practices that Promote Self-Regulated Learning

Keywords: In-service Teachers, Learning Strategies, Metacognition, Pre-service Teachers, Secondary Education, Self-regulated Learning and Behaviour, Teacher Professional Development
Interest group: SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Michael Lawson, Flinders University, Australia
Discussant: Patricia Alexander, University of Maryland, United States

The symposium will present theoretical and empirical work that examines the role of teachers in the promotion of self-regulated learning (SRL), through the review of the relevant literature, classroom observation studies, and professional development courses. The first presentation provides a comprehensive review of research on the professional competencies of teachers as they relate to SRL. It also suggests the questions that need to be addressed in future research in order to better understand the complex relations between teachers, teacher practices and the development of students' SRL. The second presentation describes research that investigated the direct and indirect promotion of SRL in the classroom through the development of a theoretical framework and a corresponding coding guide. The SRL coding guide was used to analyze the transcripts of classroom observations from 23 participating teachers. The third study to be presented investigated the effects of an online professional learning program (PLP) addressed to pre-service teachers. Through video viewing and the coding of transcripts of viewed classroom observations, the PLP was instrumental in helping preservice teachers to learn how to promote SRL indirectly, through the design of lesson tasks that encourage constructive and interactive student engagement. The last presentation describes a theoretical framework and a practical model for professional development designed to help teachers improve their SRL knowledge for in-class practices. A 30-hour professional development program will be described.

Using the COACTIV model to explain teachers' SRL professional competence
Presenting Author: Charlotte Dignath, TU Dortmund University, Germany; **Co-Author:**Mareike Kunter, DIPF | Leibniz Institute for Research and Information in Education, Germany

Research has shown that SRL can be learned and promoted using various methods. Promoting SRL should therefore be an important goal of instruction. Yet, only recently has there been research on the role of teachers in developing and promoting students' SRL. In order to provide a comprehensive overview of previous research on these issues and to identify research gaps, a literature review was conducted that classified the available evidence using the COACTIV model. The Coactiv model specifies determinants and consequences of teachers' professional competence (Kunter et al., 2011). The identified studies were sorted according to the research questions of (1) which aspects of professional competence predict teachers' classroom behavior in terms of promoting SRL, (2) how SRL classroom behavior is related to different student and teacher variables, (3) how individual and contextual conditioning factors are related to the aspects of competence, and (4) which learning opportunities are effective for developing professional competence in SRL and how teachers use these learning opportunities. The findings provide a specific overview of research on determinants and consequences of teachers' professional competence with regard to promoting SRL and offers concrete insights into research gaps that remain to be filled. Moreover, we suggest directions for future research by providing explicit guidance on what questions would need to be addressed to better understand the complex interactions between teachers, their instruction, and their students' learning success with respect to SRL.

A "Triple SRL–SRT Framework" for Supporting Teachers Self- regulation and Students' Outcomes
Presenting Author: Bracha Kramarski, Bar-Ilan University, Israel; **Co-Author:**Orna Heaysman, Hemdat College of Education, Israel

Addressing teachers' difficulties in implementing effective self-regulated learning (SRL) for their professional knowledge and practice as well as for their students' SRL learning, a "Triple SRL–SRT Framework" and a practical model for professional development is proposed to help teachers' lack of SRL knowledge for in-class practices. To cope with these challenges, a clear conceptualization that differentiates teachers' self-regulation as learners (SRL) vs. teachers (SRT) is needed.Expanding on prior dual frameworks that differentiate teachers' own SRL from their self-regulated teaching (SRT), the "triple SRL–SRT framework" distinguishes teacher-focused from student-focused aspects of SRT. Specifically, three types of self-regulation are proposed:(1) teachers self-regulate their own learning as learners (SRL)(2) teachers self-regulate their practice as teachers (teacher-focused SRT)(3) teachers as agents of SRL activate students' SRL (student-focused SRT).To support teachers' self-regulation using this framework, an SRL-SRT theoretical-practical professional PD (30 h) was developed and supported by research findings among teachers and their students. Teachers' SRL–SRT in-class practices' duration(N = 76 language teachers) and their students' language achievement (reading comprehension; grades 3-5; N = 313) increased. Conceptual contributions, practical implications and research findings will be discussed.

Helping pre-service teachers improve the indirect promotion of SRL in the classroom

Presenting Author: Helen Stephenson, University of South Australia, Australia; **Co-Author:**Sean Kang, The University of Melbourne, Australia; **Co-Author:**Wendy Scott, The University of Melbourne, Australia

The research investigated the effectiveness of an online professional learning program (PLP) on preservice teachers' ability to design lesson plans that facilitate the indirect promotion of self-regulated learning (SRL) through the design of a learning environment that encourages constructive and interactive student engagement. The PLP was based on the Interactive, Constructive, Active, Passive (ICAP) theory (Chi & Wiley, 2014). It developed an ICAP Coding Guide (ICAP-CG), which was used to analyze the transcripts of viewed videos of classroom observation, focusing on the analysis of lesson tasks. Seventy-eight education students participated in the study. The results indicated that the great majority of the participants understood the ICAP theory and the ICAP coding guide adequately, and that the PLP significantly increased their ability to design constructive and interactive lesson tasks that increase student cognitive engagement. Relationships between beliefs about learning and teaching and PLP performance are also discussed

How teachers promote self-regulated learning: A classroom observation study
Presenting Author: Stella Vosniadou, Flinders University, Australia; **Co-Author:**Erin Bodner, Flinders University, Australia; **Co-Author:**Michael Lawson, Flinders University, Australia; **Co-Author:**Lorraine Graham, The University of Melbourne, Australia

The purpose of the research was to investigate the direct and indirect promotion of SRL in the classroom. For this reason, we developed a theoretical framework and a coding guide, which was used to analyze the transcripts of filmed classroom observations from 23 participating teachers. The direct promotion of SRL was evaluated by examining the explicit and implicit promotion of strategies, the promotion of knowledge and beliefs about SRL, and the promotion of metacognitive support and reflection. The indirect promotion of SRL was evaluated by examining whether the teachers designed constructive and interactive lesson tasks that gave their students opportunities to develop self-regulation. Regarding the direct promotion of SRL, the results showed very little explicit promotion of strategies and of SRL knowledge or beliefs. The teachers engaged mainly in the implicit promotion of strategies and also provided their students with metacognitive support and metacognitive reflection. The results regarding the implicit promotion of SRL showed that the teachers designed few constructive and interactive lesson tasks and gave their students few opportunities to make decisions about their learning. There were considerable teacher differences in the frequency of SRL promotion as well as in lesson task design.

Session J 6

24 August 2023 14:45 - 16:15
AUTH_T002
Symposium
Cognitive Science, Developmental Aspects of Instruction

Different perspectives on the impact of cognitive skills on early academic achievement

Keywords: Achievement, Cognitive Development, Cognitive Skills and Processes, Developmental Processes, Early Childhood Education, Learning and Developmental Difficulties, Mathematics/Numeracy, Primary Education, Writing/Literacy
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 12 - Writing
Chairperson: Michelle N. Maurer, University of Oslo, Norway
Discussant: Bert De Smedt, KU LEUVEN, Belgium

The purpose of the proposed symposium is to bring together findings and expertise from researchers from the Netherlands, Switzerland, Norway, and Belgium on the impact of cognitive and affective skills on children's early academic achievement in typically developing 3- to 11-year-old children. Using a person-centered approach (latent profile analysis), the first paper examines the impact of cognitive and affective variables on school readiness and early academic achievement and discusses multiple pathways to school readiness. The second paper investigates the impact of cognitive and fine motor variables on handwriting skills in a large-scale longitudinal study in first grade children. Applying a latent profile analysis as well, the third paper aimed to identify executive functions profiles in first grade children to investigate whether weaknesses in one executive function component can be compensated by strength in another with respect to certain academic outcomes. The fourth paper applies a network analysis to examine the interrelations among cognitive and affective variables, and mathematical achievement, which is a novel approach to study these interrelations at a system level. The symposium takes different methodological perspectives on the interrelation between cognitive and affective variables, and early academic achievement. The proposed research projects are timely, interesting, and the findings contribute to a more nuanced understanding of how interindividual differences in cognitive and affective processes impact children's academic achievement.

Cognitive skills and academic achievement: a person-centered approach.
Presenting Author: Erica Kamphorst, University of Groningen, Netherlands; **Co-Author:**Gerda van der Veer, University of Groningen, Netherlands; **Co-Author:**Suzanne Houwen, University of Groningen, Netherlands; **Co-Author:**Marja Cantell, University Groningen, Netherlands; **Co-Author:**Alexander Minnaert, University of Groningen, Netherlands

Different cognitive skills have been found to be pivotal for a child's school readiness and subsequent academic achievement. A promising approach for studying school readiness involves a person-centered (PC) approach, aimed at exploring how functioning in diverse developmental domains conjointly affects children's school outcomes. Therefore, we aimed to explore how cognitive skills, in combination with school readiness skills from other domains predict academic achievement. To this end, we examined the school readiness skills of typically developing children (N = 91) with a mean age of 3 years and 4 months (46 % girls). We used a multi-informant (*i.e.,* performance based tests and parent ratings) test battery to assess children's school readiness in terms of motor, socioemotional, language and executive function skills, as well as first grade academic outcomes. Preliminary findings based on a Latent Profile Analysis revealed 4 distinct school readiness profiles, characterized by between-profile differences in both level and pattern of school readiness skills, specifically in some of the cognitive skills. Children from distinct profiles differed in terms of first grade academic achievement. Further testing will be aimed at distribution of background variables (*e.g.,* gender) over profiles, and predictive validity concerning specific first grade academic achievement outcomes. Our findings highlight the importance of a multifaceted description of a child's cognitive- and non-cognitive school readiness, rather than a summary label, such as 'average' or 'high'. Importantly, gained insights could help (early) childhood education and care professionals to prepare themselves to be ready for each child's unique needs.

The development of handwriting processes and involved cognitive processes
Presenting Author: Lidia Jana Truxius, PHBern, University of Teacher Education, Switzerland; **Co-Author:**Michelle N. Maurer, University of Oslo, Norway; **Co-Author:**Judith Sägesser, University of Teacher Education Bern, Switzerland; **Co-Author:**Claudia Roebers, University of Bern, Switzerland

Handwriting is still an important task as it predicts further academic achievement. At the beginning of school, pen movements are strongly controlled and demand a lot of cognitive resources. With increasing practice, handwriting becomes more automatized. Before children reach automaticity in handwriting, it remains unclear how motor processes of handwriting develop and which cognitive and fine motor processes might support handwriting processes. For this reason, we aim to investigate developmental trajectories of motor handwriting processes in the first year of handwriting acquisition. Additionally, we investigate how executive functions and visuomotor integration support the development of handwriting processes. We tested first-grade children (N = 359, M_{age} = 84, *SD* = 5) in their first year of handwriting tuition in three waves, each three months apart. Analyses of the first measurement point reveal links between handwriting processes, executive functions, and visuomotor integration. These preliminary findings indicate the importance of executive functions and visuomotor integration on the motor aspects of handwriting.

Executive Functions: Development and differential profiles in first grade children
Presenting Author: Michelle N. Maurer, University of Oslo, Norway; **Co-Author:**Claudia Roebers, University of Bern, Switzerland

Executive functions (EF) are a crucial school readiness factor predicting gains in academic achievement from kindergarten to second grade (e.g., Brock et al., 2018). As investigations on EF typically use EF as a source of individual differences for predicting several outcomes, relatively little is known about subgroups of

children (i.e., profiles) with similar strengths and weaknesses in the different EF components. With the present study, we aimed to identify potential EF profiles, that is, to investigate whether weaknesses in one EF component can be compensated by strength in another with respect to a certain academic outcome. Specifically, we investigated children's EF (inhibition, shifting, verbal and visual-spatial working memory) across three tasks and three measurements, each three months apart. We used a person-centered approach, specifically a Latent Profile Analysis, to explore EF profiles. Three-hundred fifty-nine children aged 6-8 years (M_{age} =7 years, 0 months; *SD*= 5 months) at the beginning of the study were investigated. Data analysis is still under way but preliminary results of the Latent Profile Analysis point to one subgroup of children with low inhibition skills, whereas two other subgroups are characterized by between-profile differences in the level of EF skills, instead of patterns of strengths and weaknesses across the different EF components. More specific findings on the different EF profiles and potential compensatory mechanisms with respect to specific academic outcomes will be presented and discussed at the conference. Findings will enable teachers to better understand and meet children's unique needs and help to tailor effective interventions.

A network model of cognitive and affective variables related to mathematics achievement
Presenting Author: Anne van Hoogmoed, Radboud University, Netherlands; **Co-Author:**Paul Adriaanse, Radboud University Nijmegen, Netherlands; **Co-Author:**Myrthe Vermeiden, Radboud University Nijmegen, Behavioural Science Institute, Netherlands; **Co-Author:**Rianne Weggemans, Radboud University Nijmegen, Netherlands

Development of mathematical skills is a complex and multidimensional process, with many factors associated to this development. The relation between these factors and mathematical achievement is often studied in isolation, or with a small set of factors. However, research has shown that relations between these factors and mathematical achievement are not unidirectional. Moreover, relations between these different factors themselves also exist. Therefore, this study aims to examine the relations between math skills and related cognitive and affective factors using a network approach. Data on math development and associated cognitive and affective factors are gathered from a typically developing sample of Dutch primary school children in grade 4 (currently 150 participants, data collection still ongoing). A network analysis using a mixed graphical model was used to examine how cognitive variables fluid reasoning, arithmetic fluency, number sense, ordering, shifting, inhibition, updating, and affective variables math anxiety, and math confidence are interrelated with mathematical achievement. Mathematical achievement was found to be associated with arithmetic fluency, fluid reasoning skills, and with the confidence in one's math skills. Arithmetic fluency, was associated with ordering, and was directly and indirectly associated with symbolic number sense. The network also found supporting evidence for the relations between symbolic and non-symbolic number sense and number ordering. Of the executive functions, only updating was indirectly related to mathematics achievement. These results show the benefit of using a network approach, and can eventually aid the development of a more personalized approach of dealing with differences in math development.

Session J 7

24 August 2023 14:45 - 16:15
AUTH_DC3
Symposium
Culture, Morality, Religion and Education, Learning and Social Interaction

Students as Citizens: Exploring Lived Democratic Citizenship Through Attitudes and Behaviors

Keywords: Attitudes and Beliefs, Citizenship Education, Cultural Diversity in School, Dialogic Pedagogy, Morality and Moral Development, Peer Interaction, Primary Education, Quantitative Methods, Reasoning, Secondary Education, Social Aspects of Learning and Teaching, Social Interaction, Teaching Approaches
Interest group: SIG 13 - Moral and Democratic Education
Chairperson: Bjorn Wansink, Utrecht University, Netherlands
Organiser: Minke Krijnen, Leiden University, Netherlands
Discussant: Jeremy Stoddard, United States

To sustain increasingly diverse democratic societies, people need democratic citizenship competences more than ever. The classroom context provides students with rich experiences that fit a broad conceptualization of citizenship (i.e., lived citizenship), which acknowledges students' attitudes and everyday behaviors as acts of citizenship. This lived citizenship perspective offers opportunities for implicit democratic citizenship learning. In line with this, this symposium integrates international research on students' attitudes and behaviors as aspects of democratic citizenship. It asks how students' democratic citizenship attitudes and behaviors can be fostered or hindered by students' own experiences, experiences with peers, and with their teachers. The first two papers look at students' citizenship attitudes: Paper 1 focuses on whether students' sense of school membership can promote their generalized social trust. Paper 2 explores how teacher fairness and an open classroom climate can contribute to students' political tolerance. The other two papers focus on students' citizenship behavior: Paper 3 examines deliberative discussions as practising democratic citizenship competences in interaction with classmates. Paper 4 focuses on how everyday teacher support and conflict can shape the classroom as democratic practice ground, by looking at acts of citizenship at the level of the peer group. Finally, the discussion explores how teachers and education more in general can foster citizenship learning, beyond offering a formal citizenship curriculum. With this symposium, we contribute to the EARLI conference theme by broadening our perspective on democratic citizenship learning, hereby exploring new, hopeful ways to sustain democracy in times of uncertainty.

Diverse Sources of Trust: Sense of School Membership, Generalized Social Trust and School Diversity
Presenting Author: Willemijn Rinnooy Kan, Amsterdam University of Applied Sciences (AUAS), Netherlands; **Co-Author:**Anke Munniksma, University of Amsterdam, Netherlands; **Co-Author:**Monique Volman, University of Amsterdam, Netherlands

This study investigated how schools can contribute to students' generalized social trust (GST). Positive social experiences with trust and the experience of being part of a fair and predictable social system are important sources of trust. Students' sense of school membership (SSM) reflects these sources. We investigated the association between three aspects of SSM and GST in 9^{th} grade of Dutch secondary schools (78 schools, 230 classrooms, 5167 students). The diversity of the school population, in terms of track and ethnicity, was included as a moderator. All three aspects of SSM appeared to be positively associated with GST. School ethnic diversity strengthened the association between 'identification and participation' and GST, but weakened the association between 'peer acceptance' and GST. This creates an impetus to support all students to experience a sense of school membership and raises the question how students can profit more from the diversity of the school community.

Teachers Are Important for Political Tolerance – Results from ICCS 2016
Presenting Author: Johanna Fee Ziemes, University of Duisburg-Essen, Germany

Political tolerance describes the support of rights of all groups to participate in political decision-making processes. Teachers are important for the political development of adolescents. Beside teaching content, they can treat student's more or less fair and foster discussions in the classroom. Teacher fairness can demonstrate students that all voices have a right to be heard and that everybody deserves to be treated with respect. A true open classroom climate for discussion can enable students to hear perspectives from students that otherwise might be more reluctant to share their perspectives. This paper explores the opportunities teachers have to foster political tolerance in schools with data from the International Civic and Citizenship Education Study 2016 (ICCS 2016). The study included three scales on support of equal rights. Using selected items of each of those scales and the alignment method one scale with a satisfactory fit for all 15 participating European educational systems was created. Multilevel and multigroup analyses revealed that on the individual student level a fair treatment by teachers is a significant predictor of political tolerance in all countries, while an open classroom climate for discussion is relevant at the classroom level. The results indicate that students that feel like they are being treated unfairly are less likely to develop political tolerance. Additionally, teachers that manage to foster discourses with the whole class, are on good path to foster political tolerance with this class.

CANCELLED: The Imagined Other in Classroom Deliberations (...)
Presenting Author: Lee Jerome, Middlesex University, United Kingdom; **Co-Author:**Anna Liddle, Sheffield Hallam University, United Kingdom; **Co-**

Author: Helen Young, London South Bank University, United Kingdom

This paper has been cancelled and will not be presented at the conference.Deliberative democracy offers a means for developing inclusive collective decision-making, and its proponents argue it can also build citizens' knowledge, reasoning, and critical thinking as well as develop empathy and mutual understanding among diverse groups. Those applying deliberative democratic principles in education have also tended to focus on the mechanisms for talking and listening to others (as opposed to more established hierarchical forms of teacher led talk), as well as the impact on critical thinking about arguments and a willingness to listen to and appreciate the views and beliefs of others. This article considers data from deliberative discussions in secondary classrooms in England about what the Government refers to as 'fundamental British values' (FBVs). The data shows that once students had engaged with the stimulus material provided, they often used their imagination to move significantly beyond the facts they were given. This reflects a playful commitment to develop empathy and de-centre their discussions through forms of speculative thought experiments as a way to recognise the legitimate other in such debates. As such the article makes a contribution to the literature on deliberative pedagogies in schools and begins to outline some potentially novel elaborations on deliberative democratic theory.

Teacher Practices Shape The Elementary Classroom as Practice Ground for Democracy
Presenting Author: Minke Krijnen, Leiden University, Netherlands; **Co-Author:**Bjorn Wansink, Utrecht University, Netherlands; **Co-Author:**Jan van Tartwijk, Utrecht University, Netherlands; **Co-Author:**Tim Mainhard, Leiden University, Netherlands

The elementary classroom can be considered as a practice ground for democracy, where daily experiences with peers reflect and contribute to democratic citizenship learning. Here, children can learn to engage with others in a peaceful and democratic way, which ultimately may contribute to sustaining increasingly diverse democratic societies. This perspective of enacted or lived citizenship asks for researching democratic citizenship learning beyond solely focusing on individual development and effects of teaching the formal curriculum. The current study investigates how teachers shape this practice ground via daily teaching practices. Children's observations of peers' behaviors (i.e., listening, cooperation, conflict resolution, involving others, aggression and engaging in positive relationships) were assessed via peer nominations to consider the context-dependent and relational nature of children's citizenship, and used to create classroom descriptive norms of enacted democratic citizenship. Teacher practices were assessed by multi-informant measures of support and conflict. Classroom diversity was measured by indicators for migration history and socioeconomic background, to test whether the association between teacher practices and democratic citizenship outcomes is dependent on classroom diversity. Preliminary analyses revealed that especially peer-perceived teacher support is positively associated with democratic citizenship behavior at the level of the classroom, whereas peer-perceived and self-reports of teacher conflict was associated with more aggression. These results indicate that children actively observe teachers' implicit democratic practices and that this can affect how children interact with each other as democratic citizens in the classroom.

Session J 8

24 August 2023 14:45 - 16:15
UOM_CR
Symposium
Learning and Instructional Technology

A look behind immersive scenes: Experiments on effective learning in virtual reality environments

Keywords: Computer-assisted Learning, Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Educational Technologies, Emotion and Affect, Higher Education, Immersive Technologies for Learning, Learning Strategies, Mathematics/Numeracy, Multimedia Learning, Problem Solving
Interest group:
Chairperson: Christian Hartmann, Technical University Munich, Germany
Chairperson: Valentina Nachtigall, Ruhr University Bochum, Germany
Organiser: Christian Hartmann, Technical University Munich, Germany
Organiser: Valentina Nachtigall, Ruhr University Bochum, Germany
Discussant: Eleni Kyza, Cyprus University of Technology, Cyprus

Immersive virtual reality (IVR) media enable authentic experiences by locating the user and the user's own actions in a virtual environment (cf. "immersion"). Although IVR has been shown to enhance learning by increasing motivation and cognitive engagement, some studies also show negative effects of IVR on learning. Hence, the promising potential of nearly limitless, authentic learning opportunities is contrasted by heterogeneous findings on the effectiveness of IVR. Our symposium aims to understand heterogenous findings through empirical contributions investigating both learning mechanisms and ways for supporting learning with IVR. The first paper shows that learners' visual imagery compensates for disadvantages of non-immersive media over IVR-technology in terms of sense of spatial presence and motivational effects. The second paper presents theoretical and empirical evidence of how embodied interactions in IVR support students' conceptual understanding. In addition, two contributions explore how learning strategies can support learning with IVR. Both compare individual and collaborative learning with IVR as well as identify ways to support students, either by promoting cognitive learning strategies or by helping students to regulate their emotional arousal through the immersive experience. All contributions take an experimental research approach, cover different features of IVR technology (visuality & interactivity) and represent different domains (mathematics, biology, history, and architecture). By addressing a variety of aspects of IVR-technology in different domains, against a backdrop of sound experimental methodology, this symposium helps understanding mechanisms underlying the effectiveness of IVR and contributes to the question of how learners can be effectively supported while learning with immersive media.

Imagine & immerse yourself: Does visual-spatial-imagery moderate learning in virtual reality?
Presenting Author: Christian Hartmann, Technical University Munich, Germany; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany

Findings on the effectiveness of learning in immersive virtual reality (IVR) are mixed. While studies suggest that feeling spatially present in IVR enhances motivation and therefore learning, it is unclear whether IVR also presents information in a manner more conducive to learning than less-immersive presentations. According to theories on multimedia learning, combining pictorial and semantic representations in IVR lead to a more coherent mental model compared to presenting only one of these representations. Because IVR represents spatial-situational details more accurately than less-immersive media, IVR-presentations should promote the acquisition of spatial and thus additionally (mostly auditory) presented semantic knowledge. However, research hints that students' visual-spatial-imagery may compensate for incomplete spatial representations, that is, learners who are presented less immersive, and accordingly, less accurate representations of spatial-situational details may compensate missing information by means of their imagination. Consequently, positive effects of IVR-presentations on learning and also IVR's effects on the feeling of spatial presence and motivation might be compensated by learners' visual-spatial-imagery. We addressed this research gap by conducting an experiment in which a virtual-learning-environment was presented either using immersive IVR-technology or less-immersive desktop-VR (DVR). Results unexpectedly show that IVR did not better support learning spatial and semantic knowledge, and this was not moderated by visual-spatial-imagery. Spatial presence and motivation mediated semantic knowledge acquisition in both conditions, and this effect was moderated by the learners' level of visual-spatial-imagery: IVR's advantages over DVR in promoting spatial presence, motivation, and semantic knowledge diminished as learners' visual-spatial-imagery increased. These findings explain mixed results of IVR-research.

Embodied interaction in virtual reality for learning mathematics
Presenting Author: Julia Chatain, ETH Zurich, Switzerland; **Co-Author:**Robert W. Sumner, ETH Zurich, Switzerland; **Co-Author:**Manu Kapur, ETH Zurich, Switzerland

Although mathematics has often been thought of as disembodied, recent work highlights the major role of the learners' bodies in learning mathematics. Immersive virtual-reality (IVR) technologies offer an outstanding potential for investigating and supporting embodied learning in mathematical education. However, so far, this potential has not yet covered sufficiently by theoretical and empirical support. In this paper, we address this research gap by, firstly, spotlighting three theoretical approaches to embodiment involved in IVR learning activities: (1) embodied cognition, (2) embodied interaction, and (3) avatar embodiment. We, secondly, present four empirical studies and connect our findings to two use cases: "Grasping derivatives" and "Grounding graph theory". Our

results show that IVR provides an error-friendly space for students to learn, specifically math anxious students. Moreover, our findings suggest that IVR is a powerful tool to ground abstract concepts in embodied concreteness, which, unlike other forms of concreteness, does not impair transfer abilities. However, not all IVR activities were shown to promote embodied learning: compared to position-centered approaches, movement-centered embodied interaction impaired learning outcomes and persistence. Based on two theoretically and empirically supported use cases, our contribution discusses and highlights design aspects of embodied IVR that should be considered in further studies and educational practice.

Aids to learning in virtual reality: Adding individual and collaborative generative activities
Presenting Author: Gustav Petersen, University of Copenhagen, Denmark; **Co-Author:**Valdemar Stenberdt, University of Copenhagen, Denmark; **Co-Author:**Richard E. Mayer, University of California, United States; **Co-Author:**Guido Makransky, University of Copenhagen, Denmark

Immersive virtual reality (IVR) technology can provide engaging learning experiences that would be inaccessible in the real world. However, a persisting issue with learning in IVR is that learners get distracted by the novelty of the technological experience, and neglect to engage in generative processing devoted to making sense of the learning material; unless prompted to do so by generative learning strategies (GLSs) added to the virtual environment. The majority of prior studies on using GLSs in IVR have focused on individual learners. However, as indicated by classic theories of learning such as Social Cognitive Theory, learning is also a social process, and better understanding is often achieved through performing collaborative learning activities with others. The aim of this study is therefore to investigate the effectiveness of individual and collaborative generative activities in IVR compared to a control condition. We conducted an experiment with Danish high school students who were randomly assigned to three conditions: individual experience without generative learning activities (control group), individual experience with generative learning activity prompts, and collaboration in IVR with generative learning activity prompts. The instructional material was an IVR experience involving a journey through the human bloodstream. The learning outcomes were factual, conceptual, and spatial knowledge. Results indicate that collaborative generative activities is more effective than individual learning without generative activities in terms of spatial knowledge. A trend favoring collaboration can also be observed with regard to factual knowledge. These preliminary findings support the educational value of multiplayer IVR experiences.

Promoting cognitive processing of 360° videos through emotion regulation and collaboration
Presenting Author: Valentina Nachtigall, Ruhr University Bochum, Germany; **Co-Author:**Selina Yek, Ruhr-University Bochum, Germany; **Co-Author:**Nikol Rummel, Ruhr University Bochum, Germany

History-related 360°-videos are characterized by immersive characteristics and an emotionalized representation of the content. These features of immersive virtual reality (IVR) media bear the risk to emotionally overwhelm learners, preventing them from cognitively processing the content. In a previous study, we examined whether a strategy training on the use of cognitive strategies (e.g., summarizing the content, formulating conclusions) can foster a more cognitive and less emotional processing of history-related 360°-IVR-videos and found first positive effects of this training. The present study aims to investigate whether a more cognitive and less emotional processing of the 360°-IVR-videos can be further supported by an extended training promoting not only cognitive but also emotion-regulation strategies (e.g., accepting and redirecting one's emotions). We additionally explore how a collaboratively conducted video analysis affects students' processing of the content. For this purpose, we are currently conducting a quasi-experimental study (current sample: $N = 146$) varying two factors: type of training (basic vs. extended) and social form (individual vs. collaborative). We expect positive effects of the extended training on students' use of emotion-regulation strategies for analyzing the 360°-videos and on the type of their analyses (e.g. more reflective). Regarding the social form, preliminary findings suggest differences in students' video processing prior to the training: for instance, students who collaborated in small groups focused more strongly on drawing conclusions in their analyses than students who worked alone.

Session J 9

24 August 2023 14:45 - 16:15
AUTH_DC1
Symposium

Self-regulated Learning at Different Levels of Granularity: From Single Lessons to Entire Lectures

Keywords: Achievement, Educational Technologies, Eye Tracking, Higher Education, Learning Analytics, Metacognition, Self-regulated Learning and Behaviour
Interest group: SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Luise von Keyserlingk, University of Tübingen, Germany
Chairperson: Fani Lauermann, University of Bonn, Germany
Discussant: Philip Winne, Simon Fraser University, Canada

Self-regulated learning (SRL)—as a cyclical process of planning, monitoring, and evaluating one's learning—is central to academic success in higher education. Increasingly, online learning management systems (LMS) are being used in education as a means to better understand and potentially support students' SRL—i.e., their self-regulatory cycles of planning, monitoring, and self-evaluations. However, the use of LMS data poses theoretical and methodological challenges. These include, for instance, questions about the validity of SRL measures such as digital trace data (e.g., click activities) and the extent to which such data can be used to capture SRL at different levels of granularity (e.g., in single tasks, course-units, or entire courses). This symposium brings together four studies that use LMS data from higher education contexts in three countries. All studies use multiple data sources and address questions regarding the validity of SRL measures and/or investigate SRL cycles at different levels of granularity. Study 1 uses multi-channel data to validate SRL measures based on LMS data in micro-level settings with specific learning tasks. Study 2 uses previously validated SRL measures in science courses to investigate which types of SRL-behaviors in single course-units predict end-of-course performance. Study 3 investigates whether variation in click activities across one quarter predicts end-of-course performance, and if self-reported SRL-intentions predict click activities in subsequent weeks. Study 4 investigates whether initial SRL-goals predict SRL-behaviors and course performance across entire lectures. The discussant is a leading expert in SRL research with multi-source data and will discuss unique directions for future research.

Triangulation and Integration of Measuring Self-regulated Learning with Trace and Think Aloud Data
Presenting Author: Yizhou Fan, Peking University, China; **Co-Author:**Mladen Raković, Monash University, Australia; **Co-Author:**Joep van der Graaf, Radboud University Nijmegen, Netherlands; **Co-Author:**Lyn Lim, Technical University of Munich, Germany; **Co-Author:**Shaveen Singh, Monash University, Australia; **Co-Author:**Johanna Moore, University of Edingburgh, United Kingdom; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany; **Co-Author:**Dragan Gasevic, Monash University, Australia

Many learners struggle to productively self-regulate their learning. To support the learners' self-regulated learning (SRL) and boost their achievement, it is essential to understand the cognitive and metacognitive processes that underlie SRL. To measure these processes, contemporary SRL researchers have largely utilised think aloud or trace data, however, not without challenges. In this paper, we present the findings of a study that investigated how concurrent analysis and integration of think aloud and trace data could advance the measurement of SRL and assist in better understanding the mechanisms of SRL processes. We concurrently collected think aloud and trace data generated by 44 university students in a laboratory setting and analysed those data relative to the same timeline. We found that the two data channels could be interchangeably used to measure SRL processes for only 17.18% of all time segments in a learning task. Moreover, SRL processes for around 45% of all time segments could be detected via either trace data or think aloud. For another 27.17% of all time segments, different SRL processes were detected in both data channels. Our results largely suggest that the two data collection methods can be used to complement each other in measuring SRL. The integration of the two methods further allowed us to reveal a more complex, complete, and comprehensive SRL process model compared to using a single method. In future research, the integrated measurement of SRL can be used to improve the detection of SRL processes and provide a fuller picture of SRL.

Studying Cyclical and Temporal Aspects of Self-Regulated Learning with Validated Digital Trace Data

Presenting Author: Jeff Greene, university of north carolina at chapel hill, United States; **Co-Author:**Matthew Bernacki, University of North Carolina at Chapel Hill, United States; **Co-Author:**Michael Berro, University of North Carolina at Chapel Hill, United States; **Co-Author:**Robert Plumley, University of North Carolina at Chapel Hill, United States; **Co-Author:**Shelbi Kuhlmann, University of North Carolina at Chapel Hill, United States

Digital trace data offer scalable, unobtrusive ways of capturing college students' self-regulated learning processes in large science courses. However, inferences from digital trace data must be validated before they can be used to understand and predict performance. In a previous study, we used multimodal data collection methods to validate inferences from digital trace data via aligned think-aloud protocol data collected during a laboratory session designed to mirror an actual biology lesson. Having validated what those digital trace data imply about self-regulated learning processing, in this study we gathered the same digital trace data at scale, in a large undergraduate science course, before and during the same lesson we modeled in our laboratory study. Then, we investigated whether and how self-regulated learning processing in a single cycle (i.e., one lesson) predicted performance on a subsequent exam covering the learning objectives from that lesson. We found validated digital trace data, capturing self-regulated learning processing during the lesson, predicted exam performance above and beyond the role of prior knowledge and an ancillary treatment. These findings provide evidence of the predictive validity of digital trace data validated via aligned think-aloud protocol data, pointing to new opportunities for exploring understudied aspects of self-regulated learning theory, including its dynamic, temporal, and contingent aspects.

From Time to Deadline to Time After Deadline: Steady Study Activities are Key for Course Performance

Presenting Author: Luise von Keyserlingk, University of Tübingen, Germany; **Co-Author:**Fani Lauermann, University of Bonn, Germany; **Co-Author:**Renzhe Yu, Teachers College, Columbia University, United States; **Co-Author:**Qiujie Li, University of California, Irvine, United States; **Co-Author:**Jutta Heckhausen, University of California, Irvine, United States; **Co-Author:**Jacquelynne S. Eccles, University of California, Irvine, United States; **Co-Author:**Richard Arum, University of California, Irvine, United States

Self-regulated learning (SRL) is highly relevant for academic success in higher education. However, incoming students often struggle with self-regulating their learning in college. We use self-report data and digital trace data from a learning management system (LMS) to measure students' SRL-behaviors and their links with academic performance in the Fall 2020—a quarter when LMS were particularly relevant for remote teaching due to the COVID-19 pandemic. We used behavioral trace data from four chemistry lectures at a public U.S. university (N = 1,597 students). Additionally, we used self-report data on the intended use of SRL-strategies from a small subsample (N=55). Results revealed that students' click activity in their courses showed substantial variation across the 10 weeks of the quarter, with decreases in clicks across the quarter and increased click activity in exam weeks. Students with a lower decline and more regular click activities attained better grades. Increased click activity during exam weeks did not predict students' final course grades, whereas a smaller decline in click activity in the week after each exam predicted higher end-of-term performance. Intentions to increase time and effort to prepare for a future exam only led to short-term increases in click activity after the midterm exams and were not predictive of increased end-of-term click activity (around final exams). Jointly, the conducted analyses indicate that steady study activities are important for students' end-of-term performance but students seemed to struggle with implementing long-lasting adaptations to their study activities, despite reporting positive SRL-intentions.

Self-testing in Higher Education: What Predicts the Use of Self-testing and Who Achieves Their Goals

Presenting Author: Jakob Schwerter, Institute for School Development Research (IFS), TU Dortmund, Germany; **Co-Author:**Fani Lauermann, University of Bonn, Germany; **Co-Author:**Taiga Brahm, University of Tübingen, Germany; **Co-Author:**Kou Murayama, University of Tübingen, Germany

Practice tests in conjunction with performance feedback can support student self-regulation (Ibabe & Jauregizar, 2010). However, evidence suggests that students' willingness to take self-tests is often low (e.g., about 25% in Förster et al., 2018). To date, we know very little about the psychological characteristics of students who are most likely to use and benefit from self-testing. Accordingly, using a wide range of predictor variables and the machine learning approach LASSO, this study examined the psychological characteristics of students who are most likely to use self-tests, meet their self-set course goals, and use self-tests continuously throughout the semester. We used data from two studies: economics students (N=312, 54% female) enrolled in a first-semester mathematics gateway course (Study 1) and social science students (N=117, 58% female) enrolled in a third-semester statistics course (Study 2). In both studies, students had different opportunities to self-test during the semester. There was little overlap in the selected variables for the number of self-test attempts or achievement of self-set self-testing goals between the two studies. Finally, the results highlight the need to consider not only the psychological but also contextual features of self-testing.

Session J 10

24 August 2023 14:45 - 16:15
UOM_A02
Symposium
Motivational, Social and Affective Processes

Well-being in school as a hope in challenging times: Insights from various perspectives

Keywords: Burnout, Developmental Processes, Emotion and Affect, Engagement, Pandemic, Resilience, Secondary Education, Self-efficacy, Social Aspects of Learning and Teaching, Teacher Professional Development, Well-being
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Caroline Mansfield, Australia
Organiser: Tina Hascher, Switzerland
Organiser: Julia Morinaj, University of Bern, Switzerland
Discussant: Daniela Raccanello, University of Verona, Italy

Within educational systems, individuals' thriving and success depend on educational environments that enable experiences of positive emotions and cognition such as enjoyment and positive attitudes and that prevent negative experiences such as worries and complaints. Particularly uncertain times, such as the COVID-19 pandemic, call for a better support of student, teacher, and principal well-being. Due to its multidimensional character, the idea of well-being in education includes a variety of approaches and perspectives that consider an array of aspects related to well-being. The common goal of the four presentations from four countries (Portugal, Finland, Switzerland, and Germany) in this symposium is to identify factors that contribute to well-being in school and that can inform us about possible well-being intervention programs in school and teacher education. The presentations mirror the variety of theoretical approaches as well as methodological designs. The first presentation investigated cross-sectionally the associations of physical, mental, and social well-being with resilience, motivation, commitment, and self-efficacy based on a questionnaire with Portuguese teachers. The second presentation assessed changes in work engagement and burnout of Finish teachers and principals by applying a person-centreed approach with five measurement points during the COVID-19 pandemic. The third presentation examines through semi-structured interviews how Swiss teachers cope with subjective challenges, activate a resilience process, and try to maintain their well-being. The fourth presentation analyses the effectiveness of three form of an art-of-living intervention program on the well-being of German high school students.

Framing teacher well-being: A study with Portuguese teachers

Presenting Author: Francisco Peixoto, ISPA - Instituto Universitário | Center for Research in Education, Portugal; **Presenting Author:**José Castro Silva, ISPA-Instituto Universitário, Portugal

Teacher well-being has a significant impact on schools, teachers, and students. Many of the negative effects of low well-being are well publicized, with stress or burnout being linked to attrition and the resulting teacher shortages worldwide. This has led to calls for teacher well-being to be taken seriously for the long-term sustainability of the profession. Although a great deal of literature highlights the stressful nature of the teaching profession, there is a lack of consensus in how to operationalize teacher well-being. Furthermore, only a minority of scholars grounded their studies in the teaching profession (Hascher & Waber, 2021). The main goal of the present study was to examine the interplay between the factors that frame well-being among Portuguese teachers. Participants are primary and

middle school teachers from Portugal (*n* = 1807). Preliminary results showed that: 1) at the cognitive level, resilience and self-efficacy related positively with physical and mental well-being; 2) at subjective level, the motivation related to the societal impact of teaching is negatively associated to the physical and mental well-being, whereas the motivation related to the benefits of teaching and commitment are positively associated to well-being; and 3) at the social level, the three factors considered (relationships with students, colleagues, and directive board) are positively related to physical and mental well-being.

Teachers' and principals' work engagement and work burnout during the pandemic
Presenting Author: Katariina Salmela-Aro, Helsinki University, Finland; **Co-Author:**Katja Upadyaya, University of Helsinki, Finland; **Co-Author:**Lauri Hietajärvi, University of Helsinki, Finland

The aim was to examine teachers and principals work engagement and burnout during the pandemic. 5864 teachers filled in the questionnaire during the pandemic (spring 2020, fall 2020, spring 2021, fall 2021, spring 2022). The person-oriented results among the teachers showed that during spring 2020, four groups among the teachers were identified: burnout (10%), engaged-exhausted (10%), risk of burnout (40%) and engaged (40%), while during the fall 2021 five groups were identified: burnout (14%), burnout-cynical (8%), engaged-exhausted (29%), risk of burnout (29%) and engaged (20%). Burnout and engaged-exhausted groups were twice as large in year 2021 than in the beginning of the pandemic, while the engaged was twice as large in the beginning of the pandemic. The variable-oriented results also showed silver-lining. Work engagement first decreased among the teachers during the years 2020 and 2021, while work engagement recovered during the spring 2022. In turn, teachers' work burnout increased during the years 2020 and 2021, while small decrease was identified in spring 2022. About 600 principals filled in principal barometer annually from 2019 to 2022. These results showed that in the first measurement time spring 2019, about 10% suffered from work burnout, while during the spring 2022 24% suffered from work burnout. These results showed that pandemic was related to severe decreased in work-related well-being both among the teachers and principals. Interesting during the year 2022 teachers started to recover, whereas among the principals the work burnout increased even during 2022.

Understanding the resilience process that supports teacher well-being
Presenting Author: Isabelle Krummenacher, Abteilung für Schul- und Unterrichtsforschung, Institut für Erziehungswissenschaft, Bern, Switzerland; **Co-Author:**Irene Guidon, PHBern, University of Teacher Education, Switzerland; **Co-Author:**Tina Hascher, University of Bern, Institute of Educational Science, Switzerland; **Co-Author:**Julia Morinaj, University of Bern, Switzerland; **Co-Author:**Caroline Mansfield, University of Notre Dame Australia, Australia; **Co-Author:**Susan Beltman, Curtin University, Australia

Recent studies have intensified research efforts examining contextual and individual factors contributing to teachers' professional well-being (Ainsworth & Oldfield, 2019; Mansfield et al., 2016). Maintaining well-being and responding resiliently to professional challenges are valuable skills for teachers. Teacher well-being and resilience are broad constructs used across disciplines. The two constructs are dynamic and often conceptualized as multidimensional (Hascher et al., 2021). Research on teacher resilience explores why certain teachers stay in the profession despite challenges (Beltman et al., 2011; Mansfield et al., 2016). In Switzerland, however, there has been little research on this. Hascher et al. (2021) recently introduced the Aligning Well-being and Resilience in Education (AWaRE) model, which describes a resilience process embedded in contextual and individual challenges and resources. Within this process, individual teachers aim to maintain, restore, and develop their well-being. This qualitative study aims to explore the resilience process proposed in the AWaRE model and to identify relevant challenges and resources. Semi-structured interviews with *N*=29 teachers addressed the coping strategies teachers use in challenging situations. The results showed that the central contextual challenges are related to the school management, parents, and the class constellation. Support systems from the school management and the staff as well as cooperation among teachers were essential contextual resources. Problem-solving, capitalizing on social support, was a frequent coping strategy. The results will be discussed in terms of supporting a successful resilience process among teachers.

How to choose strategies to enhance art-of-living and well-being in high school students
Presenting Author: Corinna Anders, TU Darmstadt, Germany; **Co-Author:**Bernhard Schmitz, TU Darmstadt, Germany

Background: German students suffer under the pressure to perform and therefore show psychosomatic problems. Studies show, that Art-of-living (AoL) is a convenient way to enhance well-being (Tavakoli et al., 2022). To learn how to derive the optimal intervention, if not all strategies can be applied, three possible intervention types were developed, implemented and evaluated.Methods: Intervention I is based on Deci and Ryan's self-determination theory (1993) and allows participants to choose freely from a number of AoL strategies. Participants of intervention II carry out a theory guided set of five AoL strategies. Participants of intervention III apply strategies of AoL areas that show the biggest individual potential of further development. The structure of the four-hour training follows the concept of Perels et al. (2008). Well-being and AoL was measured with the AoL questionnaire (pre-, posttest and follow up) and with an online AoL diary over a 14-day period. The sample consists of N = 184 students.Results: In comparison to the control group intervention II and III show significant outcomes in the overall AoL scale. Intervention I did not show any significant changes in comparison to the control group. The trend analyses show a significant increase in well-being over a 14-day period for interventions II and III.Conclusions: The findings suggest how to choose strategies to enhance AoL and well-being in high school students.

Session J 11

24 August 2023 14:45 - 16:15
UOM_R08
Single Paper
Learning and Social Interaction, Lifelong Learning, Teaching and Teacher Education

Twitter Communities: Informal Learning and Social Aspects

Keywords: Communities of Learners and/or Practice, Computer-supported Collaborative Learning, Foreign and Second Language Acquisition, Informal Learning, Learning Analytics, Mixed-method Research, School Leadership, Social Interaction, Social Media, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development
Chairperson: Sietske van Viersen, Utrecht University, Netherlands

The Social Side of Digitization: Knowledge Mobilization among Educational Professionals on Twitter
Keywords: Informal Learning, Social Interaction, Social Media, Teacher Professional Development
Presenting Author: Martin Rehm, University of Regensburg, Germany; **Co-Author:**Lennart Klein, Universität Tübingen, Germany; **Co-Author:**Tim Fütterer, University of Tübingen, Germany; **Co-Author:**Christian Fischer, Hector Research Institute of Education Sciences and Psychology, Germany; **Co-Author:**Marie Lockton, University of California, San Diego, United States; **Co-Author:**Anita Caduff, University of California, San Diego, United States; **Co-Author:**Alan J Daly, University of California, San Diego, United States

Digitization offers a wide range of opportunities for teaching and learning, while simultaneously creating new and unprecedented challenges for schools. Educational professionals must, therefore, continuously update and expand their knowledge and skills to meet these challenges. We draw on knowledge mobilization and network theory to analyze and compare how educational professionals in Germany and the U.S. use Twitter to informally mobilize knowledge and tackle the challenges presented by digitization in schools. We combine network science and natural language processing to analyze the communication between educational professionals on Twitter. Accessing Twitter's academic API, we collected more than 1.4 million Tweets from January 1, 2020, until December 30, 2021. The data collection focused on two popular hashtags among educational professionals in the U.S. (#edchat) and Germany (#edchatde) around mobilizing knowledge about digitization in education. Our results suggest similar network structures between the two countries and the existence of brokers that are active in both hashtag conversations and seemingly contribute to knowledge mobilization across the two countries. Next to structural similarities, our findings also revealed that a number of hashtags that deal with topics around digitization in education and are used across countries. Moreover, we identified semantic differences between the two countries. More specifically, the German context was more "individual" centered, knowledge mobilization in the U.S. was more "We" focused. These insights contribute to a better understanding of network structures and shed light on how educational professionals use different types of semantics to access and share information.

Twitter's Potential for Knowledge Brokers to Improve their Knowledge Mobilization Efforts
Keywords: Foreign and Second Language Acquisition, Informal Learning, Mixed-method Research, Social Media
Presenting Author: Anita Caduff, University of California, San Diego, United States; **Co-Author:**Martin Rehm, University of Regensburg, Germany; **Co-Author:**Marie Lockton, University of California, San Diego, United States; **Co-Author:**Alan Daly, Universityof California, San Diego, United States

To improve student experiences and outcomes, education systems and organizations must enhance their knowledge mobilization. Knowledge brokers are central to the profoundly relational process of knowledge mobilization. While many knowledge brokers move in online spaces, many primarily use social media to broadcast information without its two-way engagement functionality to learn from and about their audiences. Hence, a considerable potential for using social media stays untapped. This mixed-methods case study combines interviews, social network analysis, and natural language processing to determine what knowledge brokers *want* and *can* learn from Twitter. We show that analyzing Twitter data allows us to examine communities' interests, sentiments, and the roles of users. As such, this paper starts to unpack Twitter's potential for knowledge brokers.

How do Teachers in German Twitter Communities Share, Perceive, and Use Materials?
Keywords: Computer-supported Collaborative Learning, Informal Learning, Social Media, Teacher Professional Development
Presenting Author: Fitore Morina, University of Tübingen, Germany; **Co-Author:**Tim Fütterer, University of Tübingen, Germany; **Co-Author:**Joshua M. Rosenberg, University of Tennessee-Knoxville, United States; **Co-Author:**Jeffrey Carpenter, Elon University, United States; **Co-Author:**Christian Fischer, University of Tübingen, Germany

Twitter has become important for collaboration and informal professional learning among teachers. Prior research has suggested that teachers primarily use Twitter to share and acquire materials for their teaching, but research has not documented the specifics of what curricular or other materials teachers use. This study investigates how teachers in four German hashtag community types, for example the STEM education community, share and perceive education materials. Our sample consists of more than 1,705,000 tweets from over 90,000 users. The results suggest that materials are not shared equally among the community types, for example, in the STEM community more materials are shared than in the Twitterlehrerzimmer community (German for "Teacher's Twitter lounge"). Furthermore, the sentiment of replies to tweets that contain materials is generally more positive than negative across all community types. This study advances educational research on Twitter and informs educational stakeholders about the possibilities of Twitter as a medium for informal teacher learning and a place to acquire materials for teaching.

Online Communities of Practice on Twitter: A Case Study of the German Educational Twittersphere
Keywords: Communities of Learners and/or Practice, Learning Analytics, Social Media, Teacher Professional Development
Presenting Author: Christian Fischer, University of Tübingen, Germany; **Co-Author:**Fitore Morina, University of Tübingen, Germany; **Co-Author:**Conrad Borchers, Carnegie Mellon University, United States; **Co-Author:**Lennart Klein, University of Tübingen, Germany

Twitter provides an online community space for teachers to engage in collaborative discussions with their colleagues. While most prior research often examined singular hashtag-based communities, this study provides a detailed mapping of the entire German Twittersphere (N = 2,806,873 tweets, N = 143,004 users). We describe interaction patterns across community types regarding participation patterns and sentiment to identify important communities and longitudinal engagement trends. Additionally, we provide a blueprint for nationwide mappings of educational Twitterspheres for researchers in other countries. We highlight the utility of such large-scale educational data by examining how the most popular German Twitter community, the "Twitterlehrerzimmer" (TWLZ; German for "Twitter's teacher lounge"), may fulfill characteristics of an online community of practice. Combining educational data science and qualitative methods, we examined the three dimensions of communities of practice, that is, domain, community, and practice. For educational research, this study indicates the potential of large educational Twitter data. For stakeholders in education, this study suggests that participation in online teacher communities on Twitter may provide teachers with meaningful informal online professional learning opportunities to broaden their professional networks and engage in productive collaborations with colleagues.

Complementing "Traditional" School Organization - Leveraging Social Opportunity Spaces on Twitter
Keywords: Informal Learning, School Leadership, Social Interaction, Social Media
Presenting Author: Martin Rehm, University of Regensburg, Germany; **Co-Author:**Marie Lockton, University of California, San Diego, United States; **Co-Author:**Anita Caduff, University of California, San Diego, United States; **Co-Author:**Regina Mulder, University of Regensburg, Germany; **Co-Author:**Alan J Daly, San Diego State University & University of California, San Diego, United States

Schools are facing a wide range of challenges and the importance of further enhancing collaborative approaches to share information and resources among educational professionals is increasingly more important. However, existing formal structures are often not always effective in supporting educational professionals in accessing and sharing relevant just-in-time information and resources. In this context, it has been argued that school organizations might also need to consider more informal communication and information channels to support educational professionals in their work. In this study, we employ innovative methods to examine the notion of schools as organizations, suggesting that online social opportunity spaces (SOS) are becoming an ever-increasing, complementary pillar of schools to gain valuable access to new information and resources. Using a combination of social network analyses and natural language processing, we analyze Twitter data, as an exemplary SOS, and associated user profile information over two years, from January 1, 2020, to December 31, 2021, yielding a total of 473,470 tweets and 174,552 unique users. Our findings suggest the potential of online SOS, broadening the conceptualizations of schools as organizations, and opens up the space for rethinking schools as fixed and formal organizations. Given these considerations and findings, we identify a number of practical implications for schools as organizations.

Session J 12

24 August 2023 14:45 - 16:15
UOM_A13
Single Paper
Motivational, Social and Affective Processes, Teaching and Teacher Education

Teacher Self-efficacy

Keywords: Emotion and Affect, In-service Teachers, Large-scale Assessment, Meta-analysis, Motivation, Pre-service Teachers, Quantitative Methods, Science and STEM, Secondary Education, Self-efficacy, Teacher Efficacy, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education
Chairperson: Martijn Meeter, Vrije Universiteit Amsterdam, Netherlands

Self-Efficacy and Emotions in Teachers: A Random Intercept Cross-Lagged Panel Model
Keywords: Emotion and Affect, Quantitative Methods, Secondary Education, Teacher Efficacy
Presenting Author: Barbara Balaž, Catholic University of Croatia, Croatia; **Co-Author:**Irena Burić, University of Zadar, Croatia; **Co-Author:**Mara Šimunović, Institute of Social Sciences Ivo Pilar, Croatia

Teacher self-efficacy (TSE) is assumed to have reciprocal relationship with emotions teachers experience while teaching and interacting with students. However, previous research on the relationship between TSE and teacher emotions were either based on cross-sectional designs or failed to separate stable individual differences from changes in TSE and emotions that occur within teacher over time. Thus, in the present longitudinal study, we examined the relationship between TSE and a series of teacher discrete emotions (i.e., enjoyment, pride, love, anger, hopelessness, exhaustion), by testing the random-intercept cross-lagged panel model (RI-CLPM) that separates the between-person from within-person effects. In total, 1141 teachers (881 females) from 73 secondary schools from Croatia filled out online questionnaires four times within one school year. The results showed that, at the between-person level, stable parts of TSE were positively associated to positive emotions and negatively to negative emotions. The same pattern of the relationship was found at the within-

person level concurrently. On the other hand, results pertaining to longitudinal cross-lagged effects at the within-person level, were not that straightforward. Specifically, TSE and emotions of enjoyment and exhaustion were reciprocally related over time, while emotions of pride, anger, and hopelessness predicted TSE, but not vice versa. Lastly, longitudinal relationship between love and TSE was not confirmed. Our findings provide important implications for finding ways to promote teacher emotional well-being and motivation. *This work was supported by Croatian Science Foundation (Grant No. IP-2019-04-5472)

Instructional Self-Efficacy and Student Resistance: Beliefs Matter
Keywords: Motivation, Science and STEM, Self-efficacy, Teaching/Instructional Strategies
Presenting Author:jenefer husman, University of Oregon, United States; **Co-Author:**Maura Borrego, University of Texas - Austin, United States; **Co-Author:**Cynthia Finelli, University of Michigan, United States; **Co-Author:**Michael Prince, Bucknell University, United States; **Co-Author:**Lea Marlor, University of Michigan, United States

In this study we examine the influence of STEM faculty's self-efficacy for using active learning on changes in their plans to use active learning in their courses. Additionally, we examine the mediating influence of both faculty's perception and student self-report resistance to active learning. We found that faculty's self-efficacy for active learning predicted changes in their plans to use active learning in the classroom, and that this relation was largely mediated by their perception of student resistance to active learning. However, we found that faculty's perception and students' self-reported resistance was unrelated. These findings suggest that the underlying barrier to faculty adoption of active learning is not students' behavior, but rather faculty's misinterpretation of students' responses. This study is unique for its longitudinal research design, the geographic and disciplinary diversity of the sample, and for using validated measures of both student report and faculty perception of how students respond to active learning.

Patterns of Teacher Self-Efficacy: A Latent Profile Analysis with Secondary School Teachers.
Keywords: Large-scale Assessment, Self-efficacy, Teacher Efficacy, Teacher Professional Development
Presenting Author: Jing Huang, Lingnan University, Hong Kong; **Co-Author:**Youliang Zhang, Beijing University of Technology, China

This study aimed to empirically identify different self-efficacy patterns among lower secondary school teachers in Singapore, investigate possible differences in job satisfaction, constructivist beliefs, and teacher co-operation across different distinct profiles, and examine the predictions of teacher background characteristics to profile membership. The study included 3,095 lower secondary school teachers who participated in the Teaching and Learning International Survey (TALIS) 2013. Using latent profile analysis, four distinct self-efficacy profiles were identified: (a) *Low Self-Efficacy* (18.8%), (b) *Moderate Self-Efficacy* (40%), (c) *High Self-Efficacy* (27.2%), and (d) *Divergent Moderate Self-Efficacy* (14%), characterized by a high level of self-efficacy in student engagement and moderate levels of self-efficacy in classroom management and instruction. Results also demonstrated significant differences in teachers' job satisfaction, constructivist beliefs, and teacher co-operation across self-efficacy profiles. Teaching experience of teachers significantly predicted self-efficacy profile membership. These findings shed light on the heterogeneous patterns of self-efficacy among lower secondary school teachers.

"I believe in my skills!"- A meta-analysis on intervention studies promoting teacher self-efficacy.
Keywords: In-service Teachers, Meta-analysis, Pre-service Teachers, Teacher Efficacy
Presenting Author: Janina Täschner, Technical University of Munich (TUM) & ZIB (Centre for International Student Assessment), Germany; **Co-Author:**Doris Holzberger, Technical University of Munich (TUM) & ZIB (Centre for International Student Assessment), Germany

A high level of teacher self-efficacy has been identified as an important predictor for several positive outcomes such as teachers' well-being (e.g., Zee & Koomen, 2016) or high job commitment and satisfaction (e.g., Chesnut & Burley, 2015). However, it is still unclear (1) whether teachers' self-efficacy can be promoted at all, (2) whether it can be promoted equally for pre-service and in-service teachers, and (3) whether promotion effects differ depending on the sources of self-efficacy that are addressed in the interventions. Our meta-analysis summarizes the results from 119 intervention studies with 11526 pre-service and in-service teachers. Results from multilevel random effects meta-analysis reveal interventions can promote teacher self-efficacy (g = 0.47*, CI = 0.40; 0.54). Neither the career stage of the sample nor the addressed sources in the interventions moderated the effects significantly. However, characteristics of successful interventions differences across studies are detected and will be discussed.

Session J 13

24 August 2023 14:45 - 16:15
UOM_A07
Single Paper
Cognitive Science, Developmental Aspects of Instruction

Children's Numeracy Learning and Development

Keywords: Cognitive Development, Cognitive Skills and Processes, Developmental Processes, Early Childhood Education, Mathematics/Numeracy, Reading
Interest group: SIG 05 - Learning and Development in Early Childhood
Chairperson: Hans Christian Arnseth, University of Oslo, Norway

Underlying mechanisms of number comparison skills in young children
Keywords: Cognitive Development, Cognitive Skills and Processes, Early Childhood Education, Mathematics/Numeracy
Presenting Author: David Munez, National Institute of Education / Nanyang Technological University, Singapore; **Co-Author:**Josetxu Orrantia, University of Salamanca, Spain; **Co-Author:**Rosario Sánchez, University of Salamanca, Spain; **Co-Author:**Laura Matilla, Univeresity of Salamanca, Spain; **Co-Author:**Veronica Carreton, Universidad de Salamanca, Spain

Understanding the meaning of symbol numbers—or that "7" is larger than "5"— is a crucial milestone in the child's development of mathematical abilities. Performance on number comparison tasks in which children (and adults) are presented with two Arabic numbers and tasked to choose the larger number is typically used to assess such knowledge of symbol number meaning—a.k.a. symbol number magnitude processing skills. In this study, we investigated the decision-making process during number comparison in kindergarten children (n=58; M_{age}=71 months, SD_{age}=5.7; 41% females). To that end, we modeled performance data on a number comparison task according to a drift-diffusion model that parceled out stages and components of the decision-making process. In contrast to processes that have been described for adults, we found that familiarity with small numbers rather than the distance between numbers drove the decision-making process. The rate of accumulation of evidence was also affected by the order of numbers. These findings suggest different mechanisms in young children, hence, challenging extant theories regarding the meaning of children's performance/ability on number comparison tasks.

How does early maths develop? A visual representation of domain-specific maths skills across time.
Keywords: Cognitive Development, Developmental Processes, Early Childhood Education, Mathematics/Numeracy
Presenting Author: Zahra Siddiqui, UCL, United Kingdom; **Co-Author:**Laura Outhwaite, University College London, IOE, United Kingdom; **Co-Author:**Jo Van Herwegen, UCL Institute of Education, United Kingdom

Early mathematical development is vital for future educational outcomes (Davis-Kean et al., 2021). It is thus important to understand developmental pathways of mathematics in the early years (i.e., 3-7 years) that encompasses all relevant domain-specific skills. Although previous studies have considered developmental pathways from a domain-general perspective (e.g., LeFevre et al., 2010), further work is required to understand pathways within domain-specific abilities of mathematics. The present study collated, via a meta-review, relevant domain-specific intervention studies to plot a mechanistic visual representation of pathways of mathematical development. The protocol was preregistered on the Open Science Framework (https://osf.io/n4dys/). The meta-review identified 191 relevant systematic reviews, meta-analyses, and narrative reviews. All references from these reviews were collated, and 38 interventions studies were identified. These 38 studies contained 2,033 individual participants and 30 different domain-specific abilities were targeted in the interventions. Cumulatively, this resulted in 86 individual strands that were used to construct multiple pathways. Ages ranged from 43 – 83 months, with a mean of 64 months (i.e., 5.3 years). The most common domain-specific intervention strand was symbolic number line training, which showed links to abilities such as cardinality (45 months), symbolic

magnitude comparison (59 months), and arithmetic (56 months). This visual developmental model demonstrates when domain-specific abilities are most developmentally appropriate to be introduced to children. It also illustrates the developmental pathways of mathematical abilities in the early years that can be translated to the design of effective interventions and inform theoretical models of mathematical development.

Mediated paths from early fine motor and executive function skills to later math and reading fluency
Keywords: Cognitive Development, Early Childhood Education, Mathematics/Numeracy, Reading
Presenting Author: Kiat Hui Khng, National Institute of Education/Nanyang Technological University, Singapore, Singapore; **Co-Author:**David Munez, National Institute of Education / Nanyang Technological University, Singapore; **Co-Author:**Beth Ann O'Brien, National Institute of Education/Nanyang Technological University, Singapore, Singapore; **Co-Author:**EeLynn Ng, National Institute of Education, Singapore

The mechanisms and pathways underlying longitudinal links between early fine motor skills (FMS) and executive functions (EF) to later math and language skills, especially much later in development, is not yet well understood. We examined whether children's EF and FMS at the start of kindergarten predicted their later math and reading fluency towards the end of primary school—five to six years later—via mediated paths from their early math and reading skills near the end of their kindergarten schooling. Path analysis was conducted on data collected from a sample of children (*N*=514) when they were in the first and second years of kindergarten, and in late primary school. Children's FMS and EF at the start of kindergarten predicted math and reading fluency in late primary school, indirectly through their early math and reading skills by their second year of kindergarten. Additionally, early FMS directly predicted math fluency while early EF directly predicted reading fluency. Early FMS, EF, math, and reading skills accounted for a substantial amount of variability in later math and reading fluency. Early advantages in FMS and EF may allow for better skills acquisition in early education that persist through to later specific component skills. Early screening of EF or FMS difficulties at or before the start of kindergarten may be important. Preschools can include activities for FMS and EF training, which may be especially important for children who enter with poor status.

Executive function and academic outcomes across development: from kindergarten to secondary school
Keywords: Cognitive Development, Early Childhood Education, Mathematics/Numeracy, Reading
Presenting Author: Dieuwer ten Braak, University of Stavanger, Norway; **Co-Author:**Ragnhild Lenes, University of Stavanger, Norway; **Co-Author:**Ingunn Størksen, University of Stavanger, Norway

Executive function (EF) is a robust correlate of academic success but there may be important developmental changes in the relations between EF and academic subskills across development. This study investigates the relations between EF and measures of academic outcomes (literacy and mathematics) across kindergarten, 1st grade, and up to 8th grade (ages 5 – 13). Moreover, it is investigated whether the predictive strength of EF to academic outcomes varies depending on children's level of academic outcomes. EF was measured in kindergarten and 1st grade with a measure of working memory, the Digit Span (DS; Wechsler, 2003), and a more complex self-regulation measure, the Head-Toes-Knees-Shoulders task (HTKS; McClelland et al., 2014). Multiple regression models showed that in kindergarten working memory was especially predictive for 8th grade achievement while in 1st grade it was the more complex HTKS that significantly predicted secondary school achievement. Preliminary results from quantile regression analyses showed that in the early years, EF - especially working memory, was a particularly salient predictor at the lower end of the academic competence distribution. The results suggest that more complex EFs gain in predictive power as children encounter more formal learning situations in 1st grade, that EF has persistent predictive value for academics (especially mathematics) up to secondary school, and that EF may be especially important for children with low academic competence in the early years. Early screening for EF difficulties may therefore be especially beneficial for children at risk as it can provide opportunities for timely support.

Session J 14

24 August 2023 14:45 - 16:15
AUTH_TE2
Single Paper
Assessment and Evaluation, Lifelong Learning

Learning and Professional Development in Healthcare Education

Keywords: Assessment Methods, Attitudes and Beliefs, Communities of Learners and/or Practice, Competencies, Health-care Education, Informal Learning, Lifelong Learning, Mixed-method Research, Qualitative Methods, Sustainable Development
Interest group: SIG 04 - Higher Education, SIG 14 - Learning and Professional Development
Chairperson: Asa Makitalo, University of Gothenburg, Sweden

Professional development emanating from new technologies in nurses' work
Keywords: Competencies, Informal Learning, Lifelong Learning, Mixed-method Research
Presenting Author: Regina Mulder, University of Regensburg, Germany; **Co-Author:**L. Romina Bornhaupt, University of Regensburg, Germany; **Co-Author:**Patrick Beer, University of Regensburg, Germany

Technological developments cause changes in nursing, such as new tasks and related activities which may not be valued, nor explicitly mentioned, but are pivotal for good performance. These tasks and activities can be considered meta-work. The objective of this study is to discover aspects of meta-work that foster becoming and staying a professional, especially in times of change. Therefore, we focus on informal learning activities that are part of professional development, the continuous process of developing and adapting competences relevant to the profession, which occurs for instance during working, by answering: What components of professional development emanate from the implementation and use of new technology in nurses' work?A mixed-method approach was applied consisting of a systematic review (*N*=11 studies) and two explorative, and guideline-based interview studies with nurses (*N*=9; *N*=10). We conducted extraction of evidence and narrative synthesis and deductive-inductive qualitative content analysis. The review discovered components of work that changed due to technology and that led to informal learning activities. The interviews also revealed many such learning activities that resulted from the use of new technologies, such as reflection. Especially regarding changes at work, activities of externalisation seem to be crucial. These results indicate that changes at work, due to new technologies cause activities that might be considered meta-work. Furthermore, new tasks arose in changing contexts. This shows that in further developing the concept of meta-work attention could be paid to the difference between the job tasks, and actual behaviour of nurses accomplishing the work tasks.

Evidence-Based Practices of nursing students during clinical internships
Keywords: Assessment Methods, Attitudes and Beliefs, Competencies, Health-care Education
Presenting Author: Carla Quesada-Pallarès, Universitat Autònoma de Barcelona, Spain; **Presenting Author:**Anja Garone, University College Leuven Limburg, Belgium; **Co-Author:**Elena Roig Ester, Autonomous University of Barcelona, Spain; **Co-Author:**Ellen Westhof, University College Leuven Limburg, Belgium; **Co-Author:**Antonio Vega-Martínez, Autonomous University of Barcelona, Spain

Evidence-based practice is understood as conscious, explicit and judicious application of the best evidence of nursing knowledge to make decisions about the care of patients, taking into account their preferences and values, and incorporating professional expertise in this decision making. (Alonso et al., 2004). This study aims to determine the behaviours, beliefs and attitudes of nursing students towards evidence-based practice. At the same time, it assesses whether the students apply EBP and how they choose to incorporate it into their clinical practice. The questionnaire was applied to 168 nursing students after finishing their clinical internships at two universities in Flanders and one in Catalonia. Results suggest that even though there are differences among universities, these are not significant. We discuss the implications of this and other important findings in relation to nursing study programs and their clinical internships.

Relational meta-work emerging during technology integration in primary care
Keywords: Communities of Learners and/or Practice, Health-care Education, Lifelong Learning, Qualitative Methods
Presenting Author: Monika Nerland, University of Oslo, Norway; **Co-Author:**Isabel Brandenberger, University of Oslo, Norway; **Co-Author:**Mervi Hasu,

University of Oslo, Norway

The primary health services are subjected to intensified digitalisation with the aim of transforming care provision. As part of these ambitions, smart and assistive technologies are introduced to handle the growing elderly population and enhancing the opportunities for independent living among patients in need of continuous care. Recognising that technologies cannot simply be implemented in professional services, various groups of care personnel are mandated to facilitate technology integration and adapt the services for these purposes. This paper examines forms of relational meta-work that emerge in their efforts to facilitate technology integration; work that is not recognized as part of their formal tasks or job description, yet necessary for the primary tasks to be accomplished. We analyse data from research conducted in one city district within a large Norwegian municipality, comprising ethnographic observations and interviews with various groups of care workers and middle managers. Our findings show how work related to supporting, interpreting, adapting, coordinating and negotiating technology use in the services imply a range of new and often unnoticed relational demands to the care workers' expertise. These included a need to redefining and navigating relations to their colleagues, their leaders, technology vendors and clients. We argue that these forms of meta-work are essential for digitalisation processes to be realised, and should be recognized in ways of theorizing and supporting professional learning and development.

Expanding healthcare practice: meta-work generated when AMR healthcare processes are digitalised
Keywords: Communities of Learners and/or Practice, Lifelong Learning, Qualitative Methods, Sustainable Development
Presenting Author: Littlejohn Allison, University College London, United Kingdom; **Co-Author:**Koula Charitonos, The Open university UK, United Kingdom; **Co-Author:**Heli Kaatrakoski, University of Stavanger, Norway

Digitalisation of health sectors is important for social transformation in areas of health that relate to major global health challenges where fast and decisive action is needed. However, digitalisation places demands on professionals expertise by generating new forms of unseen work, termed meta-work. These forms of work are important to ensure new practices and ways of working are enabled, yet remarkably little is known about them. This study examines the evolution of healthworkers practices during the digitalisation of health sectors in three low-and-middle-income countries. We examine forms of meta-work needed to support these new practices, including building good relationships in ways that support work across disciplinary boundaries. These forms of meta-work take time and effort and are important for the expansion of practice so it is vital they are recognised and supported through policy. Organisations need to find ways to encourage dialogue across sites to acknowledge forms of meta-work then take steps to support these as authentic and valid forms of professional practice.

Session J 15

24 August 2023 14:45 - 16:15
UOM_A05
Single Paper
Higher Education, Learning and Social Interaction

Student Engagement in STEM and Literacy Classes

Keywords: Computer-assisted Learning, Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Engagement, Motivation, Qualitative Methods, Science and STEM, Social Aspects of Learning and Teaching, Social Interaction, Teacher Professional Development
Interest group: SIG 04 - Higher Education, SIG 10 - Social Interaction in Learning and Instruction
Chairperson: Vasiliki Andreou, KU LEUVEN, Belgium

Conceptualizing domain-specific student engagement by combining qualitative methods
Keywords: Computer-assisted Learning, Engagement, Qualitative Methods, Science and STEM
Presenting Author: Elissavet Papageorgiou, Delft University of Technology, Netherlands; **Co-Author:**Jacqueline Wong, Utrecht University, Netherlands; **Co-Author:**Annoesjka J. Cabo, Delft University of Technology, Netherlands

The use of educational videos in engineering mathematics has been associated with the facilitation of student engagement. Despite the increasing interest in the topic, little is known about how students engage and learn with mathematics videos. To date, no study has focused on domain-specific aspects of engagement in engineering mathematics. This study employs a bottom-up approach by examining engineering students' perceptions of their subject- and task-specific engagement, i.e., in learning mathematics with a video. We employed a qualitative method by combining mind maps with semi-structured interviews, followed by deductive and inductive content analysis. Results showed that student engagement was conceived as a three-dimensional construct. However, the level of granularity (i.e., subject, task) was found to influence students' definitions for each dimension. Furthermore, the findings reveal that student engagement in engineering mathematics plays a mediating role between student-context interactions and learning outcomes. When focusing on the specific learning task, activity-related factors were identified as the most relevant facilitators. Three activity elements were emphasized as engaging by the students: the design, the topic, and the activity's position in the course. The findings inform research on the construct conceptualization and provide insights for strengthening the development of video-based activities and interventions to improve engagement. Finally, by revealing indicators that have been less frequently examined in mathematics, the study contributes to the discussion of developing context-relevant measures for capturing engagement.

Examining proximal group progress toward high-quality disciplinary engagement
Keywords: Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Engagement, Science and STEM
Presenting Author: Toni Rogat, Purdue University, United States; **Co-Author:**Britte Cheng, Menlo Education Research, United States; **Co-Author:**Cindy Hmelo-Silver, Indiana University, United States; **Co-Author:**Anne Traynor, Purdue University, United States; **Co-Author:**Temitope F. Adeoye, Purdue University, United States; **Co-Author:**Reina Fujii, Menlo Educational Research, United States; **Co-Author:**Alexandria Holmes, Purdue University, United States

We are interested in advancing understanding of how collaborative groups make progress toward productive engagement during STEM activities. Toward this end, we investigated how collaborative groups' engagement at one time fuels their proximal engagement in the subsequent time segment of activity. This research is grounded in our situative theory and measurement of *group disciplinary engagement*, conceptualized as shared engagement norms, co-negotiated as a collective. We draw on our observational quality ratings, assigned along five dimensions, from a larger video dataset of 28 groups and our previous quantitative finding that disciplinary engagement afforded a disciplinary hook for group engagement. In the present study, we aim to richly describe this temporal pattern using our longitudinal case studies, engaging in additional qualitative analysis in a return to the video and case narratives. Results indicated that a disciplinary hook was initially afforded by: (1) the group's monitoring of their understanding, leading to voiced uncertainty, and (2) uptake of the curriculum task prompts and simulation features when exploring connections and solving the unit problem. This initial disciplinary engagement encouraged the group to join together in knowledge co-construction and elaborate in a more coordinated and collaborative fashion (i.e., high-quality collaborative engagement). Findings contribute to theory for understanding engagement dynamics of short duration and have implications for supporting ways to initiate and grow group disciplinary engagement.

Prosocial Education Supports Elementary Math and Science Classroom Climate and Engagement
Keywords: Motivation, Social Aspects of Learning and Teaching, Social Interaction, Teacher Professional Development
Presenting Author: Christi Bergin, University of Missouri, United States; **Co-Author:**Jennifer Foster, University of Missouri - Columbia, United States; **Co-Author:**Lindsay Brockmeier, University of Missouri/Columbia, United States; **Co-Author:**Bo Zhu, American Institutes for Research, United States; **Co-Author:**Ryan Williams, American Institutes for Research, United States; **Co-Author:**Cara Wylie, eMINTS National Center, United States

Prosocial Education focuses on altering teacher-student interaction using research-based strategies that increase students' prosocial behavior (e.g., helping others). It is especially important in STEM classes that use teamwork for problem-based learning among students who do not yet have the social skills for team science. We report on an intervention that provides 5th grade math and science teachers with one year of professional development (PD) in Prosocial Education (e.g., use of inductive discipline and praise for students' prosocial behavior). Teachers in 36 schools were randomly assigned to treatment and control groups. Results from blinded classroom observation and student surveys indicate that teachers receiving the PD provided more emotional support and created a more

positive classroom climate in their classrooms and that students experienced more personal engagement, more prosocial behavior from peers, and better teacher-student relationships (statistics forthcoming). While this project focused on 5th grade STEM classes, the PD model of Prosocial Education could be applied widely to other subjects and grades to increase prosocial behavior and improve classroom climate.

Session J 16

24 August 2023 14:45 - 16:15
AUTH_T102
Single Paper
Assessment and Evaluation, Higher Education, Learning and Instructional Technology

Creative Thinking, Creative Metacognition and Creativity-Fostering Teacher Behaviors

Keywords: Art Education, Creativity/Divergent Thinking, Higher Education, Inquiry Learning, Metacognition, Primary Education, Problem Solving, Qualitative Methods, Quantitative Methods, Teaching Approaches, Teaching/Instructional Strategies
Interest group: SIG 04 - Higher Education, SIG 16 - Metacognition and Self-Regulated Learning, SIG 28 - Play, Learning and Development
Chairperson: Catalina Lomos, Luxembourg

To What Extent Can Meta-Creative Pedagogy Foster Elementary School Students Creative Thinking?
Keywords: Creativity/Divergent Thinking, Metacognition, Primary Education, Problem Solving
Presenting Author: Nurit Paz-Baruch, Bar Ilan University, Israel; **Presenting Author:**Zemira Mevarech, Bar-Ilan University, Israel; **Co-Author:**Guy Grovas, School of Education, Bar-Ilan University, Israel

Fostering creative thinking and promoting metacognitive processes are two major goals of 21st-century education. However, studies examining how these components could be combined are rare. The purpose of the present study was threefold: 1) to design an innovative meta-creative pedagogy for fostering creative thinking; 2) to examine the immediate and transfer effects of this pedagogy on three components of creative thinking: fluency, flexibility, and originality; and 3) to explore students' implementation of meta-creative processes during creative problem-solving. Three sixth-grade classes (74 students) were randomly assigned as experimental and control groups. Students in the experimental group were exposed to the meta-creative pedagogy. Results indicated that students exposed to the meta-creative pedagogy scored significantly higher than the control group on both the immediate and transfer creative thinking tasks. Furthermore, students in the experimental group implemented meta-creative processes to a greater extent than those in the control group. These findings highlight the importance of using the meta-creative pedagogy to foster students' creative thinking. The theoretical and practical implications of the study are discussed.

Do We Need Metacognition for Creativity? The Necessary Condition Analysis of Creative Metacognition
Keywords: Art Education, Creativity/Divergent Thinking, Metacognition, Quantitative Methods
Presenting Author: Marek Urban, Institute of Psychology of Czech Academy of Sciences, Czech Republic; **Co-Author:**Kamila Urban, Institute for Research in Social Communication, Slovak Academy of Sciences, Slovakia

Necessary condition analysis (NCA) is a novel statistical approach following *necessity* causal logic. NCA tests whether a predictor acts as a necessary condition allowing an outcome to exist. The approach is different from the traditional *sufficiency* causal logic in which the predictor produces the outcome.The present study examines whether metacognition is an actual necessary condition of creative performance. This hypothesis assumes that metacognition is necessary for creativity to occur, but metacognition alone does not have to suffice to produce creative performance; i.e., individuals with low levels of metacognition cannot perform creatively, but individuals with high levels of metacognition may - but do not have to - perform creatively. This assumption is based on recent studies suggesting the importance of metacognitive knowledge and accurate metacognitive monitoring with subsequent regulation for the creative process. The study employs 385 graduate psychology majors and tests whether the metacognitive monitoring accuracy during resolution of the Unusual Uses Task acts as a necessary condition for creative performance in a complex Product Improvement Task. The Absolute Accuracy Index was calculated for self-evaluation and comparison judgments. In both cases, NCA found that accurate metacognitive monitoring acts as a necessary condition of creative performance with large effect sizes (d = .46, p = .008, for self-evaluation; d = .52, p < .001, for comparison). The findings open a space for re-evaluation of the role of metacognition in more traditional domains; e.g., is metacognition a necessary condition of efficient learning or reading comprehension?

Creative Problem Solving in Primary School Students
Keywords: Inquiry Learning, Qualitative Methods, Quantitative Methods, Teaching/Instructional Strategies
Presenting Author: Mare van Hooijdonk, Radboud University Nijmegen, Netherlands; **Co-Author:**Tim Mainhard, Leiden University, Netherlands; **Co-Author:**Evelyn Kroesbergen, Radboud University, Netherlands; **Co-Author:**Jan van Tartwijk, Utrecht University, Netherlands

Schools need to foster creative problem solving (CPS) in students from an early age onwards to meet the demand for creative problem solvers in modern society. Insight is needed in the nature of the CPS process and product in primary school students in order to adequately assess and nurture them. More specific, insight is needed in both the CPS *process* and *product* in these young students. Findings from a think-aloud study with fourth graders (N = 13) indicated that students' behaviors in response to a CPS task largely matched the CPS model as proposed by Treffinger, Isaksen and colleagues. Findings from a large quantitative study with 4th to 6th grade students (N = 594) showed that the relations among the CPS indicators and those with divergent thinking and academic achievement corresponded with relations found in different age groups. We therefore concluded that the CPS model can be applied in the primary school context and that CPS capability is already present in this young age group.

Creativity-Fostering Teacher Behaviors in Higher Education: A Transdisciplinary Systematic Review
Keywords: Creativity/Divergent Thinking, Higher Education, Teaching Approaches, Teaching/Instructional Strategies
Presenting Author: Rene Brauer, Maastricht University, Netherlands; **Co-Author:**Jarrod Ormiston, University of Technology Sydney, Australia; **Co-Author:**Simon Beausaert, Maastricht University, Netherlands

As a key 21st century skill, creativity has the power to shape new paths into a more socially and environmentally responsible, personally gratifying, and economically sustainable future. However, while society's demand for creativity is echoed across the world, higher education institutions, particularly teachers, struggle to support students' development of creative competencies due to insufficient research and teacher training regarding creativity-fostering skills. This transdisciplinary systematic literature review aims to address this gap by providing a comprehensive overview of creativity-fostering teacher behaviors identified in empirical studies across all academic disciplines (humanities, social-, natural-, formal-, and applied sciences).Our keyword search of all education-relevant databases identified 3356 studies. After screening abstracts, we selected 603 studies for detailed full-text review. After applying inclusion/exclusion criteria and scientific quality assessments, we included 58 studies in our final sample.Our thematic analysis identified 22 themes grouped into 6 overarching themes, framed as the 6 *Dimensions of Fostering Creativity (Affective, Cognitive, Behavioral, Meta-Cognitive, Creativity-In-Action,* and *Uncertainty*). On the basis of these dimensions, we propose a comprehensive conceptual model of teacher behaviors for creativity: *"The Unleash Creativity Model"*.This model highlights the transdisciplinary and interactive nature of creativity-fostering teacher behaviors, which were found to be largely similar across disciplines. It further highlights the complexities and challenges of teaching for creativity as an ever-changing process (balancing act) subject to conflicting needs and tensions. This review provides key practical insights for teachers and policymakers, and new research directions for a more holistic approach to teaching for creativity.

Session J 17

24 August 2023 14:45 - 16:15
UOM_A06

Single Paper
Motivational, Social and Affective Processes

Emotion and Affect in Mathematics

Keywords: Achievement, Attitudes and Beliefs, Cognitive Skills and Processes, Emotion and Affect, Mathematics/Numeracy, Pandemic, Pre-service Teachers, Quantitative Methods, Secondary Education
Interest group: SIG 08 - Motivation and Emotion, SIG 15 - Special Educational Needs
Chairperson: Erik De Corte, KU LEUVEN, Belgium

Antecedents and Consequences of Students' Emotion Profiles in Mathematics.
Keywords: Attitudes and Beliefs, Emotion and Affect, Mathematics/Numeracy, Secondary Education
Presenting Author: Tanja Held, University of Bern, Switzerland; **Co-Author:**Tina Hascher, University of Bern, Institute of Educational Science, Switzerland

In everyday school life, students experience a wide range of different emotions. Existing research emphasized the relevance of achievement emotions for learning processes, academic outcomes, and lifelong learning. However, the various emotions a student may encounter in everyday school life are not mutually exclusive, and students may experience multiple emotions simultaneously. Investigating co-occurring emotions with person-centered analyses may provide new perspectives by identifying individuals with common characteristics and assuming heterogeneous effects on outcomes across these subgroups. In this study, we identified subpopulations of students characterized by distinct emotion profiles in mathematics in the lowest ability tier in lower secondary education (Grade 7). Moreover, we examined whether students' gender, and control and value appraisals predict these profiles. Finally, we investigated the relations of the profiles with effort, inattention, motivation, and achievement. Latent Profile Analysis (LPA) was used to assess emotion profiles of 414 lower secondary school students regarding their experiences of enjoyment, pride, anxiety, anger, and boredom in mathematics. Results revealed three emotion profiles: a *negative emotion profile*, a *low emotion profile*, and an *only positive emotion profile*. Furthermore, results showed that emotion profiles can be predicted by gender and control appraisals. Moreover, profiles differed regarding students' motivational and behavioral outcomes. Therefore, the co-occurrence of emotion is an important approach to investigate emotions, their antecedents, as well as their effects on important academic outcomes.

Mathematics Emotions – Interaction Between Distance Learning and Math Performance
Keywords: Emotion and Affect, Mathematics/Numeracy, Pandemic, Quantitative Methods
Presenting Author: Anni Sydänmaanlakka, University of Helsinki, Finland; **Co-Author:**Jokke Häsä, University of Helsinki, Finland; **Co-Author:**Marja Holm, Finnish Institute for Health and Welfare, Finland; **Co-Author:**Markku Hannula, University of Helsinki, Finland

During the COVID-19 pandemic, schools faced a new challenge when students could not attend school in person. Although previous studies have found that distance learning during the pandemic was associated with more negative achievement emotions, there is little information on whether this association varied between adolescents with different levels of mathematical performance. This study examined whether students' mathematics-related achievement emotions differed between contact and distance learning across adolescents with different performance in mathematics. We controlled for student gender, their mathematics syllabus (basic or advanced), and the school's academic level.We collected data from 1,222 high school students across COUNTRY during the spring term in 2021, using a modified version of the Achievement Emotions Questionnaire – Mathematics (AEQ-M) to assess their mathematics-related achievement emotions in both contact and distance learning environments. We assessed students' levels of mathematical performance using their self-reported grade point average (GPA) for mathematics in general upper secondary school. Data were analysed using linear mixed effects modelling to examine the interaction between learning environments (contact vs. distance) and performance levels on achievement emotions. Results show that higher performing students reported more negative emotions in distance learning compared to contact learning. In contrast, lower performing students reported less anxiety in distance learning. The strengthening and dampening of different emotions between lower and higher performing students should be considered when planning distance learning.

The relationship between affective factors and basic numeracy skills in pre-service teachers
Keywords: Emotion and Affect, Mathematics/Numeracy, Pre-service Teachers, Quantitative Methods
Presenting Author: Heidi Hellstrand, Åbo Akademi University, Faculty of Education and Welfare Studies, Finland; **Co-Author:**Johan Korhonen, Åbo Akademi University, Finland; **Co-Author:**Airi Hakkarainen, University of Turku, Finland; **Co-Author:**Pirjo Aunio, University of Helsinki, Finland; **Co-Author:**Anu Laine, University of Helsinki, Finland; **Co-Author:**Pekka Räsänen, University of Turku, Finland

Abstract (words 177)This study seeks to investigate how affective factors in mathematics (i.e., self-concept, enjoyment, utility value, and anxiety) are related to basic numeracy skills (i.e., number processing and arithmetic fluency) in pre-service teachers. The sample consisted of 111 teacher students (101 female; 7 male; 3 not reported) from three universities. Affective factors were measured with a twelve-item self-reported questionnaire, modified from the Fennema-Sherman Mathematics Attitude Scale (Fennema & Sherman, 1976). Basic numeracy skills were measured with a computerized, online functional numeracy test battery that focuses on number processing and arithmetic fluency (Räsänen et al., 2021). In the preliminary analysis, correlation analysis was used to establish the relationship between the affective factors (i.e., self-concept, enjoyment, utility value, and anxiety), number processing and arithmetic fluency. The preliminary results indicate that significant moderate correlations exist between self-concept ($r = .430$, $p < .001$), enjoyment ($r = .351$, $p < .001$), utility value ($r = .221$, $p < .05$), anxiety ($r = -.375$, $p < .001$), and arithmetic fluency. However, none of the affective factors was significantly correlated to number processing.

Numerical and emotional conflict processing: Evidence from behavioral and pupil dilation data
Keywords: Achievement, Cognitive Skills and Processes, Emotion and Affect, Mathematics/Numeracy
Presenting Author: Adrien Nicolay, Universität Innsbruck, Austria; **Co-Author:**Elise Klein, Université de Paris, Sorbonne Paris Cité, Paris, France; **Co-Author:**Ronen Hershman, Department of Psychology, University of Innsbruck, Innsbruck, Austria; **Co-Author:**Dorothea Hämmerer, Department of Psychology, University of Innsbruck, Innsbruck, Austria; **Co-Author:**Elisabeth Weiss, Department of Psychology, University of Innsbruck, Innsbruck, Austria; **Co-Author:**Liane Kaufmann, Department of Psychology, University of Innsbruck, Innsbruck, Austria

Accumulating evidence suggests that numerical and emotional processing are interrelated. Nevertheless, the mechanisms underlying this interplay are still poorly understood. Against this background, we examined (i) whether the automaticity of basic numerical and emotional processing is associated and (ii) whether interindividual variability in conflict processing remains stable across different functional domains (i.e., numerical and emotional processing).Overall, 57 young healthy adults completed two Stroop tasks: a number-size Stroop task (requiring a response to the physical stimulus size while ignoring the numerical value) and a picture-word Stroop task (requiring to read the emotion word while ignoring the emotion conveyed by the simultaneously presented scenic picture).

In the picture-word Stroop task we also collected pupil dilation data, a sensitive indicator of Stroop-related conflict processing.[1] While the number-size Stroop task is an established marker of task-irrelevant automatic numerical processing, the novel picture-word task seems to trigger task-irrelevant emotional processing.[2]Behavioral results indicate an association of the automaticity of basic numerical and emotional processing. Importantly, this interrelation was also reflected in the pupillometry data (i.e., congruency effects upon processing task-irrelevant emotional stimuli). Moreover, interindividual differences remained rather stable across tasks, suggesting that domain-general cognitive conflict processing has a stable intraindividual expression in cognitive functions as diverse as emotion and number processing. Finally, the conceptual and educational implications will be discussed. References[1]Henik, A., Moyal, N., & Landstein, G. (submitted). Emotion congruity suggests automatic activation of emotional experience. [2]Hersman, R., & Henik, A. (2020). Pupillometric contribution to deciphering Stroop conflicts. *Memory & Cognition, 48*, 325-333.

Session J 18

24 August 2023 14:45 - 16:15
UOM_R05

Single Paper
Educational Policy and Systems, Learning and Social Interaction

Ecological approaches during the COVID-19 Pandemic: Families as a system of influence

Keywords: Anxiety and Stress, Developmental Processes, Digital Literacy and Learning, Early Childhood Education, Knowledge Construction, Pandemic, Parental Involvement in Learning, Primary Education, Resilience, Well-being
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Els Boshuizen, Open University of the Netherlands, Netherlands

Revisiting Bronfenbrenner's bioecological theory during a time of global crisis
Keywords: Developmental Processes, Early Childhood Education, Knowledge Construction, Pandemic
Presenting Author: Caroline Cohrssen, University of New England, Australia; **Presenting Author:**Maria Hatzigianni, University of West Attica, Greece

This theoretical paper proposes the revisiting of Bronfenbrenner's bioecological theory in response to unexpected, global phenomena which disrupt the balance of ecological systems. COVID-19 is one such phenomenon. The global impact of the pandemic has exerted pressure on macrosystems around the world as countries have taken steps to control the spread of the virus. Mandates issued by governments such as social distancing regulations, 'lockdowns' and school closures have had a profound effect on economies, employment, education, families and children. The long-term consequences of the disruption of ecological systems are not yet fully known, but the impact of the pandemic and other events with global impacts Reexamining the theory will provide us with helpful insights for the future and increase readiness in the case of another crisis (e.g., the energy crisis arising from Ukrainian war) suggest the need to reflect on increased influences on the macrosystem during times of crisis, and the impact such influences have on systems more proximal to the child. Finally, the need for longitudinal research to evaluate these modifications is also underlined.

Families in COVID-19 Pandemic - Relations of Family Type and Resources on Home Learning Environment
Keywords: Anxiety and Stress, Early Childhood Education, Pandemic, Parental Involvement in Learning
Presenting Author: Luisa Prokupek, Otto-Friedrich-University of Bamberg, Germany; **Co-Author:**Franziska Cohen, University of Education Freiburg, Germany; **Co-Author:**Elisa Oppermann, University of Bamberg, Germany; **Co-Author:**Yvonne Anders, Otto-Friedrich-University of Bamberg, Germany

In March 2020, the COVID-19 lockdown led to many challenges, especially for families with young children. We examined the adaptability of families with regard to changes in parents´ provision of home learning activities (HLA) in traditional two-parent families, single parent families and extended families compared to before the lockdown. We focused on family resources such as a supportive role distribution within the partnership and social support as predicting factors of adaptability in $N = 8.513$ families with children aged 18 to 69 months. In addition, we considered parental stress as a further influencing factor. The data depicts German families from a nationwide online survey. We found that all three family types offered more home learning activities, albeit with slight differences between the families. However, we identified differences in factors influencing family adaptability: Across all family types, we found slight to medium negative relations between adaptability and parental stress. The relations were most evident in extended families. Furthermore, social support shows medium positive relations to the adaptability of extended families. For the adaptability in single-parent families, gender-specific differences first emerged. Single fathers offered their children more parental HLA compared to the time before the lockdown than single mothers. This relation disappeared when we took parental stress and social support into account. For two-parent families and single parents, our analyses revealed barely significant relations between the investigated predictors and changes in HLA during lockdown. The results provide important indications about the functionality of extended families in crises.

A cross-cultural study during a pandemic: Parental behaviors of young children in times of lockdown
Keywords: Anxiety and Stress, Pandemic, Resilience, Well-being
Presenting Author: Galia Meoded, Tel Aviv University, Israel; **Co-Author:**Dorit Aram, Tel Aviv University, Israel; **Co-Author:**Merav Asaf, Kaye Academic College of Education, Israel; **Co-Author:**Margalit Ziv, Kaye Academic College of Education, Israel; **Co-Author:**Katerina Shtereva, Sofia University, Sofia, Bulgaria; **Co-Author:**Carmen López-Escribano, Complutense University of Madrid, Madrid, Spain; **Co-Author:**Susan Sonnenschein, University of Maryland, Baltimore County, United States

The COVID-19 pandemic triggered a substantial change in the lives of parents and children around the globe and created a unique situation that enabled studying parenting from a cross-cultural perspective in times of a shared crisis. The study portrays parenthood's universal and culturally specific characteristics during the lockdowns of March-May 2020. Parenting behaviors were studied in five cultures through the prism of the Parenting Pentagon Model. The model specifies five constructs of beneficial parenting behaviors: Partnership between the parents; parental Leadership; Love expressions; encouraging child's Independence; and adherence to Rules. Participants were 1080 parents (153 Bulgarian, 192 Israeli Arabs, 290 Israeli Jews, 304 Spanish, and 141 American) who answered online self-report questionnaires on the frequency of their daily behaviors, focusing on their young children aged 2-8-years. Findings showed that parents' Love expressions toward their children were the most prominent and expressed the centrality of these behaviors in parenting, regardless of culture. Partnership behaviors were reported as least frequent across cultures, suggesting that spouses' collaboration was challenging. Additionally, coping with the lockdown circumstances was more challenging for larger families. Findings highlighted some significant points regarding cross-cultural aspects of parenting in the five cultures and their manifestation in parent-child bonds in times of crisis. Acknowledging parents as the central agents in their children's lives during stressful times can empower and contribute to their awareness of their behaviors at home. Educational implications may assist in planning and implementing programs to improve parents' coping and agency skills in times of increased stress.

How did Germany parents of primary school children perceive remote schooling during COVID pandemic?
Keywords: Digital Literacy and Learning, Pandemic, Parental Involvement in Learning, Primary Education
Presenting Author: Katrin Gottlebe, University Leipzig, Germany; **Co-Author:**Brigitte Latzko, University of Leipzig, Germany

Parental support moderately affects students learning outcome in school (Hattie, 2013). During school closings due to the COVID-19 pandemic, parental support had to increase substantially. On the other hand, infrastructure for digital remote teaching was only on an insufficient level (Lorenz et al., 2021). The current study aims to describe how parents supported their primary school children during remote schooling in 2020/21 and how distant learning for the subject German Language in Saxon primary schools was implemented. The survey was carried out in June 2022.Parents were contacted by letter that contained the link to the anonymous online questionnaire containing questions on school achievement of the children, teaching methods and organisation of remote schooling during the pandemic restricting measures in 2020-2021. The sample consists of 105 parents (77 female; median age 42) of urban primary school children from grade 2 to 4 in Saxony.The paper presents first descriptive results that show that technical equipment of the families was rather good. Parents, mainly women, report having to combine support of their child's school assignments and their own work. As for the implementation of distant learning, data shows that student-teacher contact was very rare, feedback was seldomly given and teaching was limited to do-it-yourself by the students with support of the parents.To limit the results, the sample is very specific from an urban area in Saxony with high education level of the parents and also high school achievement level in the subject German Language.

Session J 19

24 August 2023 14:45 - 16:15
UOM_A11
Single Paper
Instructional Design, Teaching and Teacher Education

Teacher Competencies and Strategies for Improved Teaching

Keywords: Cognitive Skills and Processes, Engagement, Eye Tracking, In-service Teachers, Instructional Design, Mixed-method Research, Pre-service Teachers, Qualitative Methods, School Leadership, Self-regulated Learning and Behaviour, Teacher Efficacy, Teacher Professional Development,

Teaching/Instructional Strategies
Interest group: SIG 06 - Instructional Design, SIG 11 - Teaching and Teacher Education, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: MARIA EVANGELOU TSITIRIDOU, Greece

Analyzing teaching strategies to promote oral communication in the classroom by teachers in training
Keywords: Instructional Design, Pre-service Teachers, Qualitative Methods, Teaching/Instructional Strategies
Presenting Author: María Fernanda Rodríguez, Universidad Finis Terrae, Chile; **Co-Author:**Camila Barahona, Pontificia Universidad Católica de Chile, Chile

When teachers are in their first year of professional practice, one of their main difficulties is mastering didactic resources and teaching methods. Due to the COVID-19 lockdown, pre-service teachers had few opportunities to apply and practice teaching strategies. This study presents a case study with 20 teachers in training in a course on Didactics of Language and Communication, where activities were proposed that encourage the analysis and reflection of didactic strategies to develop and promote oral communication in primary school. Through a qualitative methodology of content analysis, the result was obtained that it was possible to introduce innovative teaching methodologies in teacher training, that the teachers in training positively valued the proposed activities; they had opportunities for peer interaction and had opportunities to link theoretical-didactic knowledge to their professional practices.

Comparing Experienced and Novice Teachers' Visual Attention to Students' Hand-Raising Behavior
Keywords: Cognitive Skills and Processes, Engagement, Eye Tracking, Teacher Professional Development
Presenting Author: Tina Seidel, Technische Universität München, Germany; **Co-Author:**Christian Kosel, TUM School of Education, Germany; **Co-Author:**Ricardo Böheim, Technical University of Munich, Germany; **Co-Author:**Doris Holzberger, Technical University of Munich (TUM) & ZIB (Centre for International Student Assessment), Germany; **Co-Author:**Katharina Schnitzler, Department Erziehungswissenschaft der Universität Potsdam, Germany; **Co-Author:**Jürgen Pfeffer, Professorship of Computational Social Science and Big Data, Germany; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany

This paper adds to the understanding of teachers' professional vision by analyzing their gaze in an instructional situation of whole-class discourse using eye-tracking data. We followed an expert-novice paradigm (10 experienced teachers and 10 novice teachers) and focused on the relationship between teachers' attentional processes and students' hand-raising behavior. We found that teachers' attentional processes were positively related to the number of hand-raisings, and that experienced teachers' gazes were more student-centered. Furthermore, experienced teachers were able to distribute their attention among more students, regardless of their hand-raising behavior. The results of the study confirm previous assumptions that experienced teachers can focus their attention on more students and their learning-relevant behaviors. The findings are integrated into recent research on teachers' knowledge-based classroom management scripts that are of relevance to understanding the visual expertise of (experienced) teachers.

Promoting teachers' diagnostic competence in self-regulated learning
Keywords: In-service Teachers, Mixed-method Research, Self-regulated Learning and Behaviour, Teacher Professional Development
Presenting Author: Kerstin Baeuerlein, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland; **Co-Author:**Sabrina Brunner, PH FHNW, Switzerland; **Co-Author:**Xenia-Lea Weber, Ruhr-University Bochum, Germany; **Co-Author:**Ferdinand Stebner, University of Osnabrück, Germany; **Co-Author:**Joachim Wirth, Ruhr-University Bochum, Germany; **Co-Author:**Yves Karlen, University of Zurich, Switzerland

Self-regulated learning (SRL) is considered an important educational goal. However, teachers struggle with diagnosing and promoting SRL. Using a mixed-methods control group design, the present study examines in-service teachers' knowledge, beliefs, and diagnostic competence regarding SRL. Furthermore, it investigates to what extent improvements can be achieved in these respects by training carried out in addition to the use of an online diagnostic tool. Forty-three teachers completed online questionnaires and used an online diagnostic tool to assess their students' SRL at two measurement time points. Twenty-nine of the teachers also participated in training between the two measurement time points. A combination of qualitative and quantitative data analysis revealed that, on average, teachers had medium-high knowledge about SRL and its diagnosis and held positive beliefs about SRL. They reported that diagnosing students' SRL is more challenging than diagnosing their subject-specific competencies. Knowledge of methods for diagnosing SRL and self-assessed competence in diagnosing SRL increased over time. However, training had no additional effect. Conclusions for teacher training on SRL and further research on teachers' diagnostic competence regarding SRL are discussed in this contribution.

Any experience?: Linking teacher efficacy, professional learning community and experiential learning
Keywords: In-service Teachers, School Leadership, Teacher Efficacy, Teacher Professional Development
Presenting Author: Takumi Yada, Finnish Institute for Educational Research, Finland; **Co-Author:**Akie Yada, University of Jyväskylä, Finland; **Co-Author:**Daisuke Choshi, Teikyo University, Japan; **Co-Author:**Tetsuhito Sakata, Otsuma Women's University, Japan; **Co-Author:**Takehiro Wakimoto, Yokohama National University, Japan; **Co-Author:**Masahiro Nakada, Shirayuri University, Japan

This study focused on how professional learning communities (PLCs), experiential learning, and teacher self-efficacy are linked. A conceptual model that relates PLCs elements including shared vision, interactive reflection, and collegiality, experiential learning and to teacher self-efficacy has been examined. Data included 3604 teachers from 204 elementary schools and 787 teachers from 90 lower secondary schools in Japan. The results of a multi-group structural equation modeling showed that some PLCs elements were linked to teachers' self-efficacy. Experiential learning worked as a mediator role in the connection between PLCs and teacher self-efficacy. Based on the results, theoretical and practical significance are discussed.

Session J 20

24 August 2023 14:45 - 16:15
UOM_R09
Single Paper
Cognitive Science, Motivational, Social and Affective Processes

Mindsets, Achievement and Beliefs

Keywords: Achievement, Attitudes and Beliefs, Educational Neuroscience, Feedback, Gender Issues, Mathematics/Numeracy, Metacognition, Mindsets, Parental Involvement in Learning, Parents' Beliefs and Affect, Science and STEM, Self-regulated Learning and Behaviour
Interest group: SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Andrienne Kerckhoffs, Netherlands

Elementary school students' mindsets and attentional neural processing of feedback
Keywords: Educational Neuroscience, Feedback, Mathematics/Numeracy, Mindsets
Presenting Author: Ita Puusepp, University of Helsinki, Finland; **Co-Author:**Tanja Linnavalli, University of Helsinki, Finland; **Co-Author:**Tuisku Tammi, University of Helsinki, Finland; **Co-Author:**Minna Huotilainen, University of Helsinki, Finland; **Co-Author:**Teija Kujala, University of Helsinki, Finland; **Co-Author:**Sonja Laine, University of Helsinki, Finland; **Co-Author:**Elina Kuusisto, Tampere University, Finland; **Co-Author:**Kirsi ja Tirri, University of Helsinki, Finland

The aim of this study was to examine the development of the associations between elementary school students' mindsets and attentional neural processing of positive and negative feedback in math. For this, data of 104 Finnish elementary school students were collected twice; during the autumn semesters of their 3^{rd} and 4^{th} grade. The participants' general intelligence mindsets were measured with a questionnaire and their brain responses elicited by performance-relevant feedback were recorded during the completion of a two-alternative choice arithmetic task. We found students' general intelligence mindset to be associated with their feedback-related P300 response in grade 4, but not in grade 3. More specifically, in the 4^{th} grade a stronger fixed mindset was associated with a larger P300 elicited by both negative and positive feedback in the arithmetic task. The change in the strength of the association from grade 3 to grade 4

possibly reflects the development of coherent mindset meaning systems during elementary school years. The found association between mindset and brain responses elicited by both positive and negative feedback possibly indicates that in evaluative situations mindsets have an effect on stimulus processing more generally.

Children's gender stereotypes in STEM ability following a growth mindset intervention
Keywords: Attitudes and Beliefs, Gender Issues, Mindsets, Science and STEM
Presenting Author: Fidelia Law, University of Exeter, United Kingdom; **Co-Author:**Luke McGuire, 1University of Exeter, United Kingdom; **Co-Author:**Mark Winterbottom, University of Cambridge, UK, United Kingdom; **Co-Author:**Adam Rutland, University of Exeter, United Kingdom

Research shows that gender stereotypes may undermine women's willingness to pursue STEM and it is damaging to girls' career aspirations, motivation, and self-efficacy in STEM. The present research breaks new ground by linking theory to educational practice and demonstrates how growth mindset intervention can be effectively executed in informal science learning contexts. The study was conducted during an hour-long interactive space science show in a science centre. Participants (n =147, female n = 77, 5 – 12-years-old; Mage= 8.60, SD= 1.70) were visitors to a science museum. Half of the sample experienced the growth mindset intervention in a space science show and the other half experienced the show without intervention (control condition). The intervention was delivered in the middle of the show, and it consisted of three elements: a growth mindset message, a writing task, and a manipulation check at the end of the survey. The findings show that mindset interventions can be successfully carried out in a science museum. This research-practice partnership offers many opportunities to explore research questions, test novel educational interventions, and design and implement impactful theory-based and outcome-focused practice. Lastly, the findings demonstrate that growth mindset messages are associated with more equitable gender stereotype awareness around STEM which are known to be instrumental in the rising gender disparity between men and women in STEM.

Parents in learning: The influence of mindsets and behavior on students' reading achievement
Keywords: Achievement, Mindsets, Parental Involvement in Learning, Parents' Beliefs and Affect
Presenting Author: Caroline Villiger, University of Teacher Education Bern, Switzerland; **Co-Author:**Nadine Schuler, PH Bern - School of Teacher Education, Switzerland; **Co-Author:**Edith Niederbacher, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland

Parents play an important role when it comes to student learning and academic achievement. Family background explains an important portion of the variance in achievement between students. Other factors, such as parental beliefs and behavior, have received much less attention in previous research. This paper examines the importance of factors such as implicit theories (growth vs. fixed mindset) in predicting the development of reading achievement. At the same time, the mediating role of parental behavior will be examined. Using a structural equation model, the postulated mechanisms are analyzed with a sample of N = 726 5th and 6th Grade students and their parents. Preliminary results show that parental beliefs (e.g., growth mindset) are particularly crucial in predicting controlling behavior, but also in predicting reading achievement over a period of seven month. The paper provides new insights in factors which are relevant to predict parental learning-related behavior, and it shows to what extent parental mindsets influence academic development of students. The results allow conclusions to be drawn regarding the question of how parents can optimally support their child in learning.

Is your mind set? Growth mindsets of students and teachers and their interaction
Keywords: Achievement, Metacognition, Mindsets, Self-regulated Learning and Behaviour
Presenting Author: Silke Hertel, Ruprecht-Karls-Universität Heidelberg, Germany; **Co-Author:**Johannes Jud, University of Zurich, Switzerland; **Co-Author:**Carmen Nadja Hirt, University of Zurich, Switzerland; **Co-Author:**Yves Karlen, University of Zurich, Switzerland

The mindsets of students and teachers play an essential role in everyday school life. Our paper links to recent research on students' growth mindsets, self-regulated learning (SRL), and academic achievement. The class-based sample allows us to extend the perspective to teachers' growth mindsets and instructional practices. We present multi-level SEM analyses based on data from N=1468 students from N=117 classes and their teachers. We applied questionnaires and knowledge tests at the student and teacher levels. At the student level, the results indicated that students' SRL growth mindset positively relates to their academic performance. Furthermore, the analyses revealed that the effect of students' SRL growth mindset on academic achievement is entirely mediated by academic self-concept and metacognitive knowledge. At the class level, teachers' intelligence growth mindset was positively related to students' intelligence growth mindset. Although the data is cross-sectional and no causal conclusions can be drawn, the findings provide important insights for further research and school practice.

Session J 21

24 August 2023 14:45 - 16:15
UOM_A10
Single Paper
Teaching and Teacher Education

Pre-service Teachers' Digital Literacy and Learning

Keywords: Competencies, Computer-assisted Learning, Digital Literacy and Learning, Educational Technologies, Higher Education, Multimedia Learning, Pre-service Teachers, Teaching/Instructional Strategies
Interest group: SIG 12 - Writing
Chairperson: Boris Eckstein, University of Teacher Education Zurich, Switzerland

Using knowledge maps as attention-directing support for writing instructional texts
Keywords: Computer-assisted Learning, Educational Technologies, Higher Education, Pre-service Teachers
Presenting Author: Inka Haehnlein, Martin Luther University Halle-Wittenberg, Germany; **Co-Author:**Pablo Pirnay-Dummer, Martin-Luther-Universität Halle-Wittenberg, Germany

Writing texts that are suitable for learning is an important aspect of teaching. External representations can help with the cognitive demands of the writing process by guiding conceptual attention and directing the focus of understanding. This experiment examines the effects of different kinds of automatically generated support on pre-service teachers' writing for teaching purposes. In a cross-sectional control-group design N=98 pre-service teachers first read a text on "metacognitive learning" and second, based on that text, wrote an instructional text for 10^{th} graders. Experimental group 1 was aided in their writing with a knowledge map, that was automatically generated from the provided source text by means of computer-linguistic technology. Experimental group 2 received a list of terms based on the knowledge map. The control group received no aid. The quality of the student texts was assessed with regard to content and transfer-criteria by trained raters. This study found transfer abilities lacking across all groups, with no effects of the type of writing support on text quality. The type of support impacted students' motivation.
Keywords: writing, text production, write-to-teach, pre-service teacher education, educational texts, computer aided writing, knowledge map

Promoting Media-Didactic Skills through Multimedia Tools – Influencing Factors on Learning Success
Keywords: Higher Education, Multimedia Learning, Pre-service Teachers, Teaching/Instructional Strategies
Presenting Author: Katharina Frank, Johannes Gutenberg-Universitaet Mainz, Germany; **Co-Author:**Olga Zlatkin-Troitschanskaia, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:**Jasmin Schlax, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:**Christian Dormann, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:**Sebastian Brueckner, Chair of business education, Germany

Prospective teachers often report that their teacher education studies do not adequately prepare them for actively applying their knowledge in complex teaching situations. This might be due to the fact that teaching practice is currently not satisfactorily anchored in teacher education curricula. In this respect, in recent years, there has been increasing demand for the targeted use of digital media in the classroom, which requires action-oriented media-didactic skills of teachers. In university teaching, multimedia teaching-and-learning tools can effectively complement traditional approaches and allow for greater individuality of use, so

that the increasing heterogeneity of trainee teachers' learning preconditions can be addressed. A German project, presented here, aims to develop, and evaluate such tools in a pre-post design with a control group to determine their key influencing factors. In the following, results regarding the influence of teacher characteristics (e.g., personal beliefs) are presented and critically discussed, also in terms of limitations.

Utility-Value Interventions Support Technology-Related Knowledge Integration but not Learning
Keywords: Competencies, Digital Literacy and Learning, Educational Technologies, Pre-service Teachers
Presenting Author: Iris Backfisch, University of Tuebingen, Germany; **Co-Author:**Leonie Sibley, University of Tübingen, Germany; **Co-Author:**Andreas Lachner, University of Tübingen, Germany; **Co-Author:**Kenneth Tulku Kirchner, University of Tuebingen, Germany; **Co-Author:**Christoff Hische, University of Tübingen, Germany; **Co-Author:**Katharina Scheiter, University of Potsdam, Germany

To be able to meaningfully use technologies for teaching, teachers need appropriate knowledge and motivational beliefs concerning their utility. The relevant knowledge is often framed as technological pedagogical content knowledge (TPACK, Mishra & Koehler, 2006) which is a very complex amalgam of diverse knowledge components. Therefore, research suggests that teachers need distinct support to integrate them. We therefore aimed at fostering pre-service teachers' knowledge integration with a utility-value intervention in a laboratory experiment (N= 43) and an online experiment (N= 115): After a pretest, pre-service teachers randomly either received the intervention (experimental group) or not (control group). Afterward, all pre-service teachers were asked to read through a hypermedia learning environment with chapters on the different knowledge components of TPACK and to answer a posttest. Whereas analyses showed no effects of the intervention on pre-service teachers' knowledge and value beliefs, epistemic network analyses demonstrated that the intervention group put more emphasis on developing integrated TPACK compared to the control group. Therefore, the utility-value intervention seemed to impact pre-service teachers' learning behavior, but not their learning outcomes, which should be aimed at in further studies.

Video Annotations to Support Pre-Service Teachers' Professional Vision for Technology Integration
Keywords: Digital Literacy and Learning, Educational Technologies, Pre-service Teachers, Teaching/Instructional Strategies
Presenting Author: Franziska Tschönhens, University of Tübingen, Germany; **Co-Author:**Ulrike Franke, University of Tübingen, Germany; **Co-Author:**Tim Fütterer, University of Tübingen, Germany; **Co-Author:**Andreas Lachner, University of Tübingen, Germany

Professional vision (noticing and reasoning of critical classroom situations) is a crucial prerequisite to effectively integrate educational technology during teaching. The use of annotation tools that allows to comment on video-taped classroom situations has the potential to enhance pre-service teachers' technology-related professional vision. However, pre-service teachers need additional support in using such annotation tools. In a field-experiment, we examined, whether and how the availability of support strategies (i.e., video-modeling examples, prompts) during using an annotation tool differently affected pre-service teachers' professional vision. Pre-service teachers (N = 167) were randomly assigned to one of four conditions in which we crossed two factors: availability of video-modeling examples before the annotation tasks (yes, no), and prompts during the annotation task (yes, no). Our findings suggest that neither video-modeling examples nor prompts had an effect on noticing. However, video-modeling examples but not prompts contributed to pre-service teachers' reasoning abilities. The findings highlight the role of advance and direct support strategies (i.e., video-modeling examples) for fostering pre-service teachers' professional vision, as a prerequisite for technology integration.

Session J 22

24 August 2023 14:45 - 16:15
UOM_R02
Poster Presentation
Learning and Instructional Technology, Learning and Social Interaction, Motivational, Social and Affective Processes

Parental Involvement in Learning

Keywords: Communication Skills, Critical Thinking, Digital Literacy and Learning, E-learning/ Online Learning, Early Childhood Education, Economics of Education, Emotion and Affect, Informal Learning, Parental Involvement in Learning, Parents' Beliefs and Affect, Primary Education, Reading, School Effectiveness, Science and STEM, Self-concept, Teacher Effectiveness, Writing/Literacy
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 10 - Social Interaction in Learning and Instruction, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Thorben Jansen, Germany

Interaction effect between parenting and teacher support on students' help-seeking behavior
Keywords: Communication Skills, Parents' Beliefs and Affect, Primary Education, Teacher Effectiveness
Presenting Author: Ayafumi Goto, Gifu Shotoku Gakuen University, Japan

This study investigated the interaction effect between parenting and teacher support on students' help-seeking behavior. A self-report questionnaire was used to assess students' perceptions of teacher support regarding help-seeking from their teachers and classmates, parenting (i.e., acceptance and control), and social competence and help-seeking behaviors toward teachers and classmates. The questionnaires were completed by 424 elementary school students. The hierarchical regression analysis controlling with grade revealed that: (a) help-seeking behavior toward classmates, among low parenting (acceptance and control), was higher when there was a low level of teacher support regarding help-seeking from teachers for boys; (b) help-seeking behavior toward classmates, among high parenting (acceptance and control), was higher when there was a high level of teacher support regarding help-seeking from classmates for boys; (c) controlled parental acceptance or control and social competence, and teacher support regarding help-seeking from teachers significantly predicted help-seeking behavior toward teachers for both boys and girls; and (d) social competence significantly predicted help-seeking behavior toward classmates for girls. These results indicate that teacher support regarding help-seeking from their teacher had a direct effect on help-seeking from teachers for boys and girls and teacher support regarding help-seeking from their classmates had a moderation effect on help-seeking from classmates for boys. Strong evidence was revealed in this study regarding the role of teacher support and family influences in promoting students' help-seeking.

Shifting online early: Online vs. face-to-face early childhood STEM parent-engagement workshop
Keywords: E-learning/ Online Learning, Early Childhood Education, Parental Involvement in Learning, Science and STEM
Presenting Author: Mona Wong, Yew Chung College of Early Childhood Education, Hong Kong; **Co-Author:**Brad Chan, Yew Chung College of Early Childhood Education, Hong Kong

Online classes have become part of the "new normal" in education. Yet, not all students, particularly young children, are well-prepared for this new teaching method. To provide quality online learning experience for children in the early year and to compensate for their loss of online learning opportunities due to developmental limitations, our project designed and implemented an online workshop for parents and children to explore STEM experiments at home. The results were compared with that from the face-to-face workshop and found that the online workshop was more able to equip parents with suitable STEM-teaching knowledge, and to engage children with STEM explorations. The results demonstrated the possibility of applying effective instructional technology in early childhood education to provide active learning.

Free access to a digital library at home: The panacea for home reading by G2 beginning readers?
Keywords: Digital Literacy and Learning, Parental Involvement in Learning, Reading, School Effectiveness
Presenting Author: Maria T. Sikkema-de Jong, Leiden University, Netherlands; **Co-Author:**Simone Vogelaar, Education and Child studies, Leiden University, Netherlands; **Co-Author:**Jane Pieplenbosch, Utrecht University, Netherlands; **Co-Author:**Ralph Rippe, Education and Child studies, Leiden University, Netherlands

We experimentally tested whether making a digital library of age-appropriate e-books available at home for free to Grade 2 beginning readers (N = 140) would result in (frequent) spare time reading. Half of the teachers involved in the study were asked to nudge the participating students aimed at using the digital library

at home (intervention group). Teachers in de the control group did not get instructions to nudge. In addition to registering log data of digital library use at home, we collected information from their parents or caretakers about the student's home environment and student characteristics like reading level, reading attitude, and executive functioning. Log data showed that just over half of the students (52%) logged on to the digital library at least once during the study that took a school year. Teachers in the intervention group had hardly ever nudged students to read at home during the schoolyear. Results are discussed in the light of the value of evidence based digital interventions in up leveling the home literacy environment.

An investigation of the relation between household chaos and students' academic outcomes
Keywords: Emotion and Affect, Parental Involvement in Learning, Primary Education, Self-concept
Presenting Author: Xiaozi Gao, The Education University of Hong Kong, Hong Kong; **Co-Author:**Frank Tian-fang Ye, The Hong Kong Polytechnic University, Hong Kong; **Co-Author:**Kerry Lee, The Education University of Hong Kong, Hong Kong; **Co-Author:**Lan Yang, The Education University of Hong Kong, Hong Kong; **Co-Author:**Kuen Fung Sin, The Education University of Hong Kong, Hong Kong

Household chaos and students' academic outcomes: The role of parental involvement and students' self-regulated learning
Research has demonstrated direct links between household chaos and impairments in child academic performance (Garrett-Peters et al., 2016). However, the underlying mechanisms responsible for the relations have not been well-established. The current study aims to contribute to this effort by examining the role of parental involvement, chaos, and children's self-regulated learning. A sample of 251 parent-child dyads were recruited in Hong Kong (M_{age} = 8.2 yrs., 51.4% girls). Students reported their academic emotional experience in home learning, academic self-concept, and self-regulated learning via an online survey. Parents reported their involvement in the children's home learning and household chaos levels. Structural equation modeling revealed that household chaos was associated with poorer academic emotion (r = .25, p = .017), less parental involvement in children's learning (r = -.65, p < .001), and poorer self-regulated learning in children (r = -.32, p < .001). However, it was not associated with children's academic self-concept (r = -.040, p = .67). Children's self-regulated learning marginally mediated the relationship between household chaos and academic emotion (β = -.82, p = .065), but parental academic involvement was not a significant mediator (β = -.17, p = .19). These findings suggest that household chaos is one potential intervention target for improving children's self-regulated learning and academic-related outcomes.

Linking Family Economic Pressure to Early Chinese Reading and Writing Skills
Keywords: Economics of Education, Parental Involvement in Learning, Reading, Writing/Literacy
Presenting Author: Ian Lam, The Education University of Hong Kong, Hong Kong; **Co-Author:**Kevin Kien Hoa Chung, The Education University of Hong Kong, Hong Kong

Little is known about the joint role of family poverty and parent-child relationships in the development of early literacy skills—a strong predictor of later cognitive and academic outcomes—among Chinese children. This study examined the longitudinal associations of family economic pressure with early Chinese reading and writing skills and tested maternal warmth as a moderator. Participants were 330 kindergarten children (mean age at Time 1 = 4.81 years; 56% were girls) and their mothers from Hong Kong, China. Children completed tests on Chinese word reading and writing at Times 1 and 2; mothers completed questionnaires on family economic pressure and parental warmth at Time 1. Multilevel models indicated that family economic pressure was linked to declines in child Chinese word reading and writing skills for children with low but not high maternal warmth, highlighting the possibility of targeting maternal warmth to promote child development in financially disadvantaged Chinese families.

The role of the home in children's critical reading skills development: A Delphi study
Keywords: Critical Thinking, Informal Learning, Parental Involvement in Learning, Reading
Presenting Author: Leena Paakkari, University of Jyväskylä, Faculty of Sport and Health Sciences, Finland; **Co-Author:**Jenni Ruotsalainen, University of Jyväskylä, Finland; **Co-Author:**Henri Lahti, University of Jyväskylä, Finland; **Co-Author:**Markus Kulmala, University of Jyväskylä, Faculty of Sport and Health Sciences, Finland; **Co-Author:**Panayiota Kendeou, University of Minnesota, United States; **Co-Author:**Tiia-Liina Raittila, University of Jyväskylä, Finland; **Co-Author:**Mari Manu, University of Jyväskylä, Finland; **Co-Author:**Jenni Salminen, University of Jyväskylä, Finland; **Co-Author:**Minna Torppa, University of Jyväskylä, Finland

Using a Delphi method, we aimed to gain a better understanding of home-related factors that support or hinder the development of critical reading skills. Experts (N =32) identified a set of home-related factors that can either hinder or support the development of critical reading skills among children and adolescents. The experts then evaluated and ranked the factors according to their perceived importance. An abundant collection of home-related factors was produced. Out of these we identified 13 factors that were seen as the main supportive factors, and 9 factors that were seen as the main hindering factors. The factors highlighted the importance of having a space for the child to be heard and involved family discussions, having a space for differing viewpoints and for critical thinking, and parental competencies to support critical reading skills and their attitudes towards schooling and learning. The findings can be used for measurement and intervention development purposes.

Session J 23

24 August 2023 14:45 - 16:15
UOM_R03
Poster Presentation
Teaching and Teacher Education

In-service Teachers' Professional Development

Keywords: Dialogic Pedagogy, Educational Neuroscience, Higher Education, In-service Teachers, Learning Strategies, Lifelong Learning, Mathematics/Numeracy, Multimedia Learning, Quantitative Methods, Social Aspects of Learning and Teaching, Synergies between Learning / Teaching and Research, Teacher Professional Development, Teaching Approaches, Teaching/Instructional Strategies, Tool Development
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development, SIG 22 - Neuroscience and Education
Chairperson: Nora McIntyre, University of Southampton, United Kingdom

Routes to change: Development of teacher educators in an educational neuroscience program
Keywords: Educational Neuroscience, Higher Education, Synergies between Learning / Teaching and Research, Teaching Approaches
Presenting Author: Efrat Luzzatto, MOFET Institute for Research, Israel; **Co-Author:**Gal Ben-Yehudah, The Mofet Institute, Israel; **Co-Author:**Orit Elgavi, Achva Academic College of Education, Israel; **Co-Author:**Etty Grobgeld, Achva Academic College, Israel

Educational neuroscience is an interdisciplinary field combining insights from education, neuroscience and psychology to enrich educational practice and improve education for all (Thomas, Ansari, & Knowland, 2019). Our research investigates changes in participants' neuro-pedagogical knowledge, attitudes and self-efficacy in a pioneering year-long program in educational neuroscience for teacher educators, school principals and policy makers. Previous research focused on programs for teachers, while this study focused on teacher educators from various cultures and disciplines. We used a mixed methods approach - a quantitative questionnaire to investigate participants' attitudes towards the relevance of educational neuroscience knowledge for learning and teaching processes, and a qualitative component, comprising reflective exercises and open-ended questions. Initial findings show that participants arrived with a positive attitude towards the importance of brain science for education and teacher training and this remained stable throughout the program, while pedagogical self-efficacy increased. Qualitative analysis of participants' reflections raised four main themes: (1) the perception of neuro-pedagogy as important and relevant (2) the new neuroscientific knowledge the participants learnt (3) the quality of teaching and special teaching methods used in the course (4) the conflict between verification of former knowledge and the questioning of ingrained concepts. The intensive program also significantly improved participants' knowledge, as evidenced by the improvement in use of neuro-pedagogical terms. The main implication of these findings is the ability to widen dissemination of educational

neuroscience among teachers by shifting the focus to teacher educators as agents of change who have a broader impact on the field.

Dialogic Teaching Development Program: what about professional identity for changing?
Keywords: Dialogic Pedagogy, In-service Teachers, Lifelong Learning, Teacher Professional Development
Presenting Author:MARIBEL CALDERON, Universidad Católica Silva Henríquez, Chile; **Co-Author:**Marisol Gomez, Universidad Alberto Hurtado, Chile

Some continuous teacher training programs from dialogic approaches have shown changes in student practices. Success is related to reflection and support for the practice itself. It is known that pedagogical decision-making and its reflection in a community as a dialogical space for taking a position, expanding perspectives, and handling contradictions emerges as an opportunity for change. Also, the construction of new senses and meanings can imply a personal dimension that can be conceived as identitary.Do a Professional Teacher Development Program for improving dialogic teaching mobilise a sense of professional identity? Does the practice change related to that? Is there any difference between explicit or implicit identity job to change the practice?20 teachers from two schools participated in a six session TDP organized by six Principles of Dialogic Teaching. One group of teachers used a logbook with specific identity tasks to complete out of the course. Research was carried out using a mix method approach, focusing on pedagogical thought about dialogue in the classroom and measuring professional identity in participants (pre-post). Register of workshop sessions, pre-post classes, individual interview, and professional identity questionnaire were used to collect information. The results are presented showing different trajectories and turns in the process of reflection on dialogue as a pedagogical object and the relation to teacher professional identity. The benefit of working with colleagues and the logbook will be discussed as tools in the relation to the domains (practice and personal respectively) to mediate in the relation to changing practice professional identity.

Classroom Observations: how teachers teach learning strategies?
Keywords: In-service Teachers, Learning Strategies, Teacher Professional Development, Teaching/Instructional Strategies
Presenting Author: Mikk Granström, Tallinn University, Estonia; **Co-Author:**Eve Kikas, Tallinn University, Estonia; **Co-Author:**Eve Eisenschmidt, Tallinn University, Estonia

The aim of this study was to find out which learning strategies teachers teach either directly or indirectly and how classroom observations are related to teachers' knowledge of learning strategies (seven different learning strategies were used for that). In the course of this study, the Learning Strategy Teaching Observation Instrument (LSTOI) was developed. 45 video-based classroom observations were conducted. The teachers' knowledge of learning strategies is good, but this knowledge is not conveyed into direct strategy teaching in the classroom. In addition to general results, a detailed description of two teachers was conducted, who provided the greatest amount of direct instructions on using strategies, in order to find out how these teachers teach learning strategies in the classroom. The results showed that although the teachers give more direct strategy instruction in the classroom than other teachers, the teachers justify the usefulness of strategies by saying that students will achieve a better result in the upcoming test/examination. However, teachers should explain to students the long-term impact of learning strategies and develop the students' skills in independently applying strategies in the future.

Correlations Between Biology Teachers' Self-Reflection, TPACK and its Reflection in Practice
Keywords: In-service Teachers, Multimedia Learning, Quantitative Methods, Teacher Professional Development
Presenting Author:Jörg Zumbach, University of Salzburg, Austria; **Co-Author:**Lena von Kotzebue, University of Salzburg, Austria; **Co-Author:**Bettina Mann, University of Salzburg, Austria

Teachers' self-reflection on the one hand and their technological pedagogical content knowledge (TPACK) on the other hand have gained significant importance over the last few years, especially since teaching is gradually shifting towards using digital technologies (Boholano et al., 2021; Koehler & Mishra, 2009). We argue that the combination of teachers' self-reflection and their TPACK leads to a new construct which we call reflected technological pedagogical content knowledge (rTPACK). However, interactions and influence of biology teacher's TPACK and self-reflection on rTPACK have not been examined yet. In order to analyze which factors can predict rTPACK we developed a quantitative questionnaire inquiring about biology teachers' self-assessment concerning self-reflection, reflective practitioner, TPACK, and rTPACK. Our findings indicate that biology teachers' self-reflection and their TPACK significantly and positively correlate with rTPACK and also predict rTPACK.

Engaged teachers and well-being: The moderating role of burnout
Keywords: In-service Teachers, Quantitative Methods, Social Aspects of Learning and Teaching, Teacher Professional Development
Presenting Author: Caterina Fiorilli, University of LUMSA, Italy; **Co-Author:**Giacomo Angelini, LUMSA University of Rome, Italy; **Co-Author:**Vanessa Marchetti, Free University Maria Santissima Assunta, Italy; **Co-Author:**Luciano Romano, European University of Rome, Italy

In recent years, attention has grown regarding teacher well-being's antecedents, including work engagement, defined as a positive, fulfilling, and work-related state of mind. Work engagement has demonstrated a positive effect on improving the well-being of teachers, reducing the impact of burnout. Nevertheless, the moderating role of burnout is still unexplored. The current study aims to overcome this lack of investigation by hypothesizing the moderating effect of burnout on the association between work engagement and well-being. The study involved 807 Italian workers (Female: 91.7%) with a mean age of 47.54 years (age range = 19-68; SD = 9.91) who completed the Burnout Assessment Tool, World Health Organization Well-Being Index, and Utrecht Work Engagement Scale. The results showed that the relation between the interaction term burnout x work engagement on well-being was significant ($\beta = -0.304$, p

Design-based Research at scale: teacher professional development program on technology-enhanced math
Keywords: In-service Teachers, Mathematics/Numeracy, Teacher Professional Development, Tool Development
Presenting Author:Jüri Kurvits, Tallinn University, Estonia; **Presenting Author:**Marina Kurvits, Tallinn University, Estonia; **Co-Author:**Tobias Ley, Danube University Krems, Austria; **Co-Author:**Kairit Tammets, Tallinn University, Estonia

Introducing innovations in the classroom through design-based research often entails single classroom interventions with subsequent attempts to generalize to other settings. We introduce an alternative model to scale DBR across 25 classrooms. Such scaling has required developing the following elements: A teacher professional development program engaging 25 teachers into the design, implementation and evaluation process; an iterative research design built into the program, and a research infrastructure that allows data collection and feedback across those 25 classroom settings. We present a case study of a teacher training in the context of math for enhancing students' engagement and demonstration of upscaling DBR.

Session J 24

24 August 2023 14:45 - 16:15
UOM_R01
Poster Presentation
Higher Education, Learning and Instructional Technology, Teaching and Teacher Education

Simulation-based Learning

Keywords: Classroom Management, Cognitive Skills and Processes, Communication Skills, Competencies, E-learning/ Online Learning, Emotion and Affect, Higher Education, Immersive Technologies for Learning, Pre-service Teachers, Quantitative Methods, Simulation-based Learning, Tool Development, Vocational Education and Apprenticeship Training
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Juliette Desiron, University of Zurich, Switzerland

Counselling competence of student teachers – development of an action-oriented assessment format
Keywords: Competencies, Higher Education, Pre-service Teachers, Simulation-based Learning
Presenting Author: Philipp Wotschel, Paderborn Centre for Educational Research and Teacher Education - PLAZ-Professional School - University of Paderborn, Germany; **Co-Author:**Christoph Vogelsang, Paderborn University, Germany; **Co-Author:**Jana Meier, University of Paderborn, Germany, Germany; **Co-Author:**Thomas Janzen, PLAZ Professional School - Paderborn University, Germany

Although counselling is an activity that is central (inherent) to teacher's job, a considerable number of teachers do not feel sufficiently prepared for future counselling activities through their academic education (Hertel & Schmitz, 2010). Teacher students are often unsuccessful in adequately applying their acquired knowledge in such contexts of action (Zeichner, 2010). Furthermore, there is a gap - especially in Germany - between non-action-oriented examinations in the university phase of teacher education and examinations under non-standardized conditions in the actual field of practice in the ensuing induction phase. In line with other professions, such as medicine, role-play-based simulations may potentially foster counselling competence of (prospective) teachers (Dotger et al., 2010; Gerich, 2016), as typical standard requirements of the profession are simulated under conditions that are as authentic as possible, though complexity is reduced (St. Pierre & Breuer, 2013). As a possible prototype of a standardized, action-oriented assessment, a performance-oriented test and related evaluation criteria were developed to record and assess counselling-related performance of student teachers. The results of a pilot study (N=9) indicate a good fit between the conceptual preliminary considerations and the feasibility of the performance tests. In feedback interviews, the student teachers consider the performance assessments as more authentic, more professionally relevant and objective, compared to written and oral exams, while the use of simulated counselling sessions is accepted as a possible summative assessment format in teacher education.

No Silver Bullet: Development of a first Sketch of a Prompt Design for Vocational Education Students
Keywords: E-learning/ Online Learning, Immersive Technologies for Learning, Simulation-based Learning, Vocational Education and Apprenticeship Training
Presenting Author: Herbert Thomann, University Mannheim, Germany; **Co-Author:**Viola Deutscher, University of Mannheim, Germany; **Co-Author:**Andreas Rausch, University of Mannheim, Germany; **Co-Author:**Juergen Seifried, University of Mannheim, Germany

Considering the shift in competency requirements for vocational students caused by digitalization, learning simulations enriched with educational prompts can make a significant contribution to meeting these changed requirements (Rausch et al., 2021). However, prompting in the context of vocational education has received only little attention. This study examines the development and potential of a prompt design in the digital office simulation LUCA, which is assumed to support problem-solving performance. During a 65-min learning sequence on the working scenario topic “supplier selection”, 680 vocational education students received either no prompts or a selection of three types of prompts (cognitive, meta-cognitive and non-cognitive) based on the learners’ individual log data. The results showed no effect of the adaptive prompts on problem-solving performance compared to the control group without prompts. A deeper analysis revealed that learners often did not perceive the prompts because they were sent through the mail system and did not appear as pop-up windows. Moreover, high cognitive load due to the immersive learning simulation and the complex working scenario could be why prompts did not lead to the expected positive outcomes (e.g., Eckhardt et al., 2013). This illustrates, that prompting is not per se always conducive to problem-solving or learning achievement and there is no silver bullet when designing prompts. For this, the prompt design was revised, and the data from additional 200 vocational students are currently being collected to test the adapted prompt design.

Simulation based learning for facilitating understanding of others’ emotions in preservice teachers
Keywords: Communication Skills, Emotion and Affect, Pre-service Teachers, Simulation-based Learning
Presenting Author: Shira Iluz, Bar Ilan University, Israel; **Co-Author:**Jacob Israelashvili, Bar Ilan University, Israel; **Co-Author:**Yaacov Boaz Yablon, Bar-Ilan University, Israel

The use of simulation based learning to facilitate social-emotional skills of teachers is an emerging and promising component in teacher education, but to date, research supporting its effectiveness is rare. The current study (N_{total}=116) is the first to measure performance in understanding others’ emotions after participation in simulation-based learning using an objective, naturalistic and validated instrument. Findings provide *proof-of-concept* demonstration that a single day of simulation training can help preservice teachers learn emotional knowledge valuable for understanding another person’s subjective experience. Furthermore, we found that simulations are particularly helpful for individuals who score high on their propensity to take others’ perspectives.

How do student teachers perceive a novel VR environment for students?
Keywords: E-learning/ Online Learning, Pre-service Teachers, Quantitative Methods, Simulation-based Learning
Presenting Author: Florentine Hickethier, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Mathias Dehne, Friedrich Schiller University Jena, Germany; **Co-Author:**Tova Michalsky, Bar-Ilan University, Israel; **Co-Author:**Engin Ader, Boğaziçi University, Turkiye; **Co-Author:**Alexander Groeschner, Friedrich Schiller University Jena, Germany

According to the Technology Acceptance Model (TAM; Davis et al., 1989), perceptions regarding the usefulness of new media, such as virtual reality (VR), may influence prospective teachers’ willingness to use these technologies in their subsequent teaching practice. This question, and how perceived usefulness changes as experience with the new medium is gained, will be explored in the current study. To implement the research project, a new VR environment designed was piloted by $N = 57$ student teachers from Finland, Germany, Israel, and Turkey. By addressing the spread of infectious diseases, the VR environment – which was basically designed for students – tangibly addresses the topic of exponential growth from mathematics classes. For the mixed-methods approach, student teachers were asked to complete a questionnaire before and after going through the VR, as well as participate in an interview on the relevance of simulation-based applications. Preliminary results indicate a positive change in terms of perceived usefulness after going through the VR simulation. This speaks to the need for teachers to gain experience with new technologies during their training phase in order to want to use them in their later professional practice.

Preservice teachers' motivations and perceived benefits of using a decision simulator
Keywords: Classroom Management, Pre-service Teachers, Simulation-based Learning, Tool Development
Presenting Author: Eli Lejonberg, University of Oslo, Norway; **Co-Author:**Eyvind Elstad, University of Oslo, Norway; **Co-Author:**Katrine Nesje, University of Oslo, Norway

Virtual classroom simulations are highlighted as a valuable addition to more traditional learning activities in teacher education. Simulation tools offer simplified simulations of classroom events and provide student teachers with an arena in which to practice performing the tasks of a teacher. We developed a decision simulator where PTs make choices related to six different scenarios in the classroom, inspired by the scenario-based SIMPROV simulation (Arvola et al., 2018). Authoritarian, authoritative, democratic, and compliant approaches to the teacher role are built into the choices PTs make in this simulation. In order to be able to optimize and adapt the use of the decision simulator to different groups of students, we investigated how students with different motivations for teaching experienced the benefits of the simulator. Our sample consisted of 88 respondents from a one-year postgraduate certificate in education (PGCE) programme. We used structural equation modelling and found a positive relationship between ability beliefs, extrinsic and altruistic motivation and the perceived use of the simulator. A surprising finding was that intrinsic motivation was negatively related to the perceived benefit of using the decision simulator.

The role of executive functions when learning in authentic learning environments
Keywords: Cognitive Skills and Processes, Higher Education, Quantitative Methods, Simulation-based Learning
Presenting Author: Maike Achtner, LMU Munich, Germany; **Co-Author:**Stefan Ufer, Ludwig-Maximilians-Universität (LMU), Germany

Learning environments must be adapted to the learner's prerequisites to ensure optimal learning success. First studies showed that depending on the executive functions working memory capacity or shifting ability, instructions can be more or less effective. However, these interactions between executive functions and learning environments have yet to be investigated in authentic learning environments. Developing complex competencies such as teachers' diagnostic skills requires authentic learning environments. Simulations are well suited for this purpose as they provide opportunities to reproduce real situations in a controlled environment. In the following study, three roles (teacher, student, observer) were designed, with different challenges and requirements to accommodate different learners. The presented study aims to answer whether executive functions play a role when learning with simulation-based roleplay. The results showed that executive functions did not influence simulation-based roleplay.

Session J 25

24 August 2023 14:45 - 16:15
UOM_R04

Poster Presentation
Motivational, Social and Affective Processes

Motivational, Cognitive and Teaching Processes

Keywords: Achievement, Assessment Methods, Cognitive Skills and Processes, Developmental Processes, Engagement, Goal Orientations, Instructional Design, Interest, Mathematics/Numeracy, Meta-analysis, Motivation, Parents' Beliefs and Affect, Peer Interaction, Quantitative Methods, Science Education, Self-concept, Social Aspects of Learning and Teaching, Well-being
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Belinda Merkle, University of Mannheim, Germany

Does domain specific mindset make a difference in learning? Two metanalysis
Keywords: Achievement, Cognitive Skills and Processes, Meta-analysis, Motivation
Presenting Author: Madalin Marian Deliu, University of Salamanca, Spain; **Co-Author:**José Ricardo García Pérez, University of Salamanca, Spain

The aim of the present study is to understand the relations of domain specific mindsets (growth vs fixed) with different motivational and achievement variables and analyse the impact of manipulating the first ones on measures of the second ones. For this purpose, a systematic searching was carried out in several relevant databases (APA PsycInfo, APA PsycArticles, ERIC, Web of Science, Academic Search Complete and Scopus). With those studies, two meta-analyses are being conducted: one for correlational data, analysing the relations between domain specific mindsets (mathematical, reading, and science) and motivational factors (self-regulation, grit, perseverance, and self-efficacy) or academic achievement (self-assessed competence, specific tasks performance, academic grades, or GPA); and another for instructional studies. In both meta-analyses effect sizes are being compared in the searching for moderators related to the participants characteristics (sex, socioeconomical status…), study methods (e.g., quasi-experimental vs experimental in the case of interventions) or intervention aspects (length, content…). The knowledge obtained will allow a better understanding of the mindset involvement in the academic learning in different domains, such as reading, and a better design of intervention to promote it.

The Role of Conditional Parental Support in the Development of Impostorism
Keywords: Developmental Processes, Parents' Beliefs and Affect, Self-concept, Well-being
Presenting Author: Thérèse Bouffard, Université du Québec à Montréal, Canada; **Co-Author:**Carole Vezeau, Université du Québec à Montréal, Canada; **Co-Author:**Pascal Pansu, Université Grenoble Alpes, France

The objective of this longitudinal study was to examine the direction of the relationship between the perception of parental conditional support and the feeling of imposture. 504 students (249 girls) aged 10-11 at the start of the study answered questionnaires on their perception of conditional parental support and their feeling of imposture over a period of five years. Using structural equation modeling, the results of cross-lagged analyzes with overlapping stability paths of each variable showed that the model where the perception of conditional support predicted the presence of the feeling of imposture the following year was the most parsimonious and the one that also best fit the data. The discussion will focus on how to prevent children from internalizing parental expectations as standards that lead them to feel like an impostor.

Situational interest, perceptions of task difficulty and Motivation2Learn more
Keywords: Assessment Methods, Interest, Mathematics/Numeracy, Motivation
Presenting Author: Luke K. Fryer, The University of Hong Kong, Hong Kong; **Co-Author:**Alex Shum, The University of Hong Kong, Hong Kong

BackgroundSituational interest and perceptions of difficulty are widely recognised components of academic task experience. Yet, how they interact across time, are affected prior knowledge and interest, and together support future interest is poorly understood.AimsThe present study aimed to extend our understanding of these components of task experience and their contribution to longer-term interest. MethodsAfter completing a pre-test, providing demographic information and prior interest, participants (n = 301; Female =167; aged 20-49) completed a series of math task, reporting their situational interest and perceptions of difficulty after each task. An online, longitudinal, micro-analytical study was designed to assess individual's situational interest and perceptions of difficulty across a series of algebraic tasks. After the set of tasks, participants were offered a follow-up opportunity to learn more about the tasks' content (i.e., personal finance).ResultsThe contributions of prior interest and knowledge to task experience were consistent with theory: raising situational interest and perceived difficulty across the four math tasks. The auto and cross-lag relationships between situational interest and perceived difficulty between sequential task signaled the positive (situational interest) and negative (perceived difficulty) roles these task components play across a pattern of learning experiences. The convergence of these aspects of the learning experience pointed to the complex sources of an individual's ongoing interest: i.e., knowledge, perceptions of task difficulty and situational interest.

Checkmate: Examining Chess Masters' Expertise in Relation to Interest and Motivation
Keywords: Achievement, Goal Orientations, Interest, Motivation
Presenting Author: Eric Schoute, University of Maryland, United States; **Co-Author:**Joshua Jaffe, University of Maryland, United States; **Co-Author:**Doug Lombardi, University of Maryland, College Park, United States

Relations between interest, motivation, and expertise have been of particular interest to educational researchers for decades. However, due to the lack of consensus of what constitutes an expert within academia, relations between these factors remain unclear. To further examine these constructs, we recruited expert chess players ($N = 48$) that have achieved National Master status from the United States Chess Federation (USCF). Players responded to items regarding their individual interest towards chess, intrinsic motivation to play chess, and extrinsic motivation to play chess. Players also reported their USCF Elo-rating (systematic measure of a player's chess strength), confirmed by the USCF public database. Statistical analysis revealed that although players expressed higher levels of individual interest and intrinsic motivation compared to extrinsic motivation, extrinsic motivation was the only significant predictor of USCF rating. Unlike previous work emphasizing the importance of individual interest and intrinsic motivation to achieve competency and expertise, the present study, which examined the top players in the United States (top .9% according to the USCF), revealed that extrinsic motivation played a significant role in chess performance. This study highlights the importance of extrinsic motivation to succeeding and becoming an expert within the field of chess.

On making biology education meaningful: Students' motivation for brewing beer
Keywords: Instructional Design, Interest, Motivation, Science Education
Presenting Author: Niels Dohn, Aarhus University, Denmark

This study investigates the significance of brewing beer on upper secondary students' interest and motivation. Since beer is an important part of the youth culture, brewing was supposed to be experienced meaningful and thus motivating. A qualitative approach was used to gather data. Student responses were coded according to motivation theory, but also open for emerging themes. The preliminary results suggest that brewing beer was interesting due to relevance and novelty but was challenged by task effort costs in terms of waiting time. The findings suggest that beer brewing can trigger situational interest due to personal relevance, which is important for students with limited interest in biology.

Are Peer and Teacher Relatedness Always Adaptive? An Analysis of (A)symmetric Congruence Processes
Keywords: Engagement, Peer Interaction, Quantitative Methods, Social Aspects of Learning and Teaching
Presenting Author: Elisa Santana Monagas, University of Las Palmas de Gran Canaria, Spain; **Co-Author:**Fernando NUNEZ-REGUEIRO, Université Grenoble Alpes, France; **Co-Author:**Jaime León, Universidad de las Palmas de Gran Canaria, Spain

Research shows that feelings of relatedness at school (i.e., feeling accepted, connected, understood, close, included, etc.) support adolescent development. Little is known, however, on how sources of school relatedness—i.e., peer and teacher relatedness—combine to create adaptive or maladaptive outcomes. To address this gap, this poster presents a study on the joint effects of peer and teacher relatedness on adolescent well-being and school engagement, by using response surface analysis (RSA), a technique that combines features of variable-centered and person-centered approaches to analyze the interplay between peer and teacher relatedness. Based on preliminary evidence and theories (self-determination theories, good lives model), 4 hypotheses are postulated in the

form of cumulative benefits (H1- additive effects), interdependent benefits (H2- negative congruence effect), peer-specific compensatory benefit (H3- positive asymmetric congruence effect), and non-specific compensatory benefits (H4- positive asymmetric incongruence and congruence effects). Using high school data ($N > 600$ adolescents aged 15 to 18), results show that well-being and engagement are strongest when both sources of relatedness are provided for, but that situations of imbalance may be detrimental to these outcomes, even at high levels of peer or teacher relatedness. Implications for theories and practices on relatedness at school are drawn. Keywords: school relatedness; adolescent well-being; school engagement; cubic polynomials

Session J 26

24 August 2023 14:45 - 16:15
UOM_GYM
Roundtable
Teaching and Teacher Education

Motivation and Self-Regulated Learning

Keywords: Argumentation, Creativity/Divergent Thinking, Emotion and Affect, Inquiry Learning, Metacognition, Motivation, Reading, School Effectiveness, Secondary Education, Self-regulated Learning and Behaviour, Teacher Effectiveness, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Leen Catrysse, Belgium

Innovative Behavior and Antecedents: Comparing Teachers with other Academic Professions
Keywords: Motivation, School Effectiveness, Teacher Effectiveness, Teacher Professional Development
Presenting Author: Verena Jörg, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Franziska Baier, Goethe-Universität Frankfurt, Germany; **Co-Author:**Ulrike Hartmann, German Institute for International Educational Research (DIPF), Germany; **Co-Author:**Stefanie Gaeckle, German Centre for Higher Education Research and Science Studies (DZHW), Germany; **Co-Author:**Mareike Kunter, DIPF | Leibniz Institute for Research and Information in Education, Germany

Todays' teachers are required to show adaptability and innovative behavior (Paniagua & Istance, 2018). Still, teachers are often seen as inert to innovation (in public and research). This claim is based on the assumptions that people who enter the teaching profession either show certain unfavourable characteristics (low openness for new experiences, risk aversion) or that characteristics of the school environment prevent innovative behavior (high workload and bureaucratic structures).The present study analyzes whether teachers show less innovative behavior than comparable employees and investigate what factors (of the individuals and the workplaces) might contribute to possible differences. We use longitudinal data of a representative German panel sample ($N_{teachers/other\ (semi-)professionals}$=435/897). Participants were surveyed at three measurement points, before entering their professional lives as well as five and seven years later.We find that while teachers differ from other (semi-)professionals in their risk aversion and openness before career entry, they even report more innovative behavior than the compared group after entering their professions. This can be explained by higher autonomy of their jobs, while earlier openness and risk aversion do not affect teachers' later innovative behavior significantly. Possible reasons for differential effects and further analysis required are discussed.

The development of students' ideas during group conversations in secondary education.
Keywords: Argumentation, Creativity/Divergent Thinking, Inquiry Learning, Secondary Education
Presenting Author: Martina van Uum, Radboud Teachers Academy, Netherlands; **Co-Author:**Petrie van der Zanden, Educational Institute of Social Sciences, Radboud University, Netherlands

In the current study, we investigate students' creative group processes during an inquiry- and design-based project in secondary education. Our research question is: How do ideas of students in secondary education develop over time during group conversations in which they share, criticize and integrate each other's ideas? The participants are 40 students in their second year of secondary education. In 10 lessons, the students (in groups of 3 or 4 students) designed a part of a garden for a residential care center in the Netherlands. We audio recorded the conversations of each group and, subsequently, transcribed fragments that focused on students' ideas. These fragments were inductively analyzed via open coding to find out how the students talked about their ideas. Subsequently, we made a timeline for each group to find out how the ideas of the students developed over time during their group conversations. Our preliminary results show that most groups of students generated and selected ideas for their garden design at the start of the project; after a few lessons when visualizing their ideas on a mood board; and in the second part of the lesson series when developing models for their part of the garden. Most of the time, students built on each other's ideas. In addition, there were moments when students provided arguments in favor of or against ideas, or ignored ideas of others. We plan to further investigate the group conversations of the students to find out how their ideas developed over time.

The influence of enjoyment on self-regulated learning from texts
Keywords: Emotion and Affect, Metacognition, Reading, Self-regulated Learning and Behaviour
Presenting Author: Celina Safferthal, University of Education Karlsruhe, Germany; **Co-Author:**Anja Prinz-Weiß, University of Education Karlsruhe, Germany

For successful self-regulated learning from texts, learners must accurately judge their comprehension and engage in effective regulation activities. Despite the well-known influence of enjoyment on learning processes and outcomes, little is known with regard to its role for judgment accuracy and regulation. First evidence indicates that higher levels of positive emotions, such as enjoyment or hope, are related to more overconfident judgments, and higher levels of negative emotions, such as anger and hopelessness, to more underconfident judgments. In the present study, we aim at investigating the impact of middle school students' enjoyment on self-regulated learning from texts. The experimental group receives a training to increase enjoyment, whereas the control group receives no training. We expect that increased enjoyment will lead to better comprehension. However, at the same time, we assume that increased enjoyment will lead to greater overconfidence in one's comprehension, which in turn will inhibit regulation activities and prevent further comprehension improvements. These results would indicate that teachers and learners must be sensitized to the circumstance that there is a downside of enjoyment because it can impair self-regulation processes.

Session J 27

24 August 2023 14:45 - 16:15
AUTH_T202
Workshop
Learning and Special Education

Daisy Robot and ARRoW Method aiming to assist children with Autism Spectrum Disorders

Keywords: Educational Technologies, Health-care Education, Social Development, Special Education
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

In this workshop will be presented how social assistive robots (SARs), have proven to be suitable tools, to assist children with autism spectrum disorders (ASD) to develop social skills and strengthen their motivation to interact with their peers. The Daisy robot, which was designed and built to be compatible with the characteristics of the autism spectrum, will be presented, its functions and scenarios will be analyzed with the utilization of the ARRoW method. Two robots will be available so that those who attend will be able to design their own scenarios and to present them using the robots. Keywords: Socially Assistive Robots,

Daisy Robot and ARRoW Method aiming to assist children with Autism Spectrum Disorders
Presenting Author: Nikolaos Fachantidis, Univeristy of Macedonia, Greece; **Co-Author:**Sofia Pliasa, University of Macedonia, Greece; **Co-Author:**Evgenia Soumelidou, University of Macedonia, Greece

In this workshop will be presented how social assistive robots (SARs), have proven to be suitable tools, to assist children with autism spectrum disorders (ASD) to develop social skills and strengthen their motivation to interact with their peers. The Daisy robot, which was designed and built to be compatible with the characteristics of the autism spectrum, will be presented, its functions and scenarios will be analyzed with the utilization of the ARRoW method. Two robots will be available so that those who attend will be able to design their own scenarios and to present them using the robots. Keywords: Socially Assistive Robots, Autism Spectrum Disorders, Daisy Robot, ARRoW Method

Session J 28

24 August 2023 14:45 - 16:15
UOM_A04
ICT Demonstration

Real-time coding of lesson activities with a mobile web application

Keywords: Educational Technologies, Pre-service Teachers, Science Education, Tool Development
Interest group:

Please bring your own device if you are attending this ICT demonstration.Video records are widely used in educational research. Although valuable, the amount of video, and possible data, can be too expansive producing challenges of their own. To help with the challenges of video selection and analysis, we developed simple web-based app for real-time coding of lesson activities. The coding can by synchronized with video records, making it easy to select relevant video segments for further use. Later the app has also been used to activate lesson observation and reflective discussion in pre-service teachers practical training without the video collection. In the demonstration we'll present how the app can be used in video-based research and how it is being used in teacher-students' practical training. The main focus will be how to setup and use the app for observations, how to share the observational frame with others and how to effectively use the app. Updated version of the app will be made available, free of charge, for all conference participants.

Real-time coding of lesson activities with a mobile web application
Presenting Author: Miikka Turkkila, University of Helsinki, Finland

Please bring your own device if you are attending this ICT demonstration.Video records are widely used in educational research. Although valuable, the amount of video, and possible data, can be too expansive producing challenges of their own. To help with the challenges of video selection and analysis, we developed simple web-based app for real-time coding of lesson activities. The coding can by synchronized with video records, making it easy to select relevant video segments for further use. Later the app has also been used to activate lesson observation and reflective discussion in pre-service teachers practical training without the video collection. In the demonstration we'll present how the app can be used in video-based research and how it is being used in teacher-students' practical training. The main focus will be how to setup and use the app for observations, how to share the observational frame with others and how to effectively use the app. Updated version of the app will be made available, free of charge, for all conference participants.

Session K 1

24 August 2023 17:00 - 18:30
HELEXPO_CC
Invited Symposium
Lifelong Learning

A Look Into the Crystal Ball: Which Directions should Metacognition and SRL Research take?

Keywords: Assessment Methods, Early Childhood Education, Educational Technologies, Emotion and Affect, Learning Strategies, Lifelong Learning, Metacognition, Self-regulated Learning and Behaviour, Teacher Professional Development
Interest group: SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Yves Karlen, University of Zurich, Switzerland
Chairperson: Charlotte Dignath, TU Dortmund University, Germany
Organiser: Yves Karlen, University of Zurich, Switzerland
Organiser: Charlotte Dignath, TU Dortmund University, Germany
Discussant: Yves Karlen, University of Zurich, Switzerland
Discussant: Charlotte Dignath, TU Dortmund University, Germany

The next generation of research in the field of metacognition and self-regulated learning (SRL) promises to make significant advances in our understanding of how individuals learn and think about their learning. Recent technological developments offer new opportunities for studying, measuring and supporting metacognitive and SRL processes. At the same time, new technologies significantly affect learning. There is also increasing recognition of the importance of social and emotional factors in metacognition and SRL. Researchers examine how these factors shape learning and thinking processes, and how they can be leveraged to support more effective learning. Current evidence indicates that the increasing individualization of education and professional development is important, as one size does not fit all. We can develop more individualised and effective learning and training approaches by better understanding and supporting individual differences in metacognition and SRL. In this field of tension in which we are currently operating, we should offer solutions to support individual learning in the present and the future. In this symposium, five world-leading experts discuss which next steps should be taken regarding theory development, the relation between metacognition/SRL and emotions, its development from early childhood on, collaborations with teachers on interventions and approaches to support SRL and metacognitive development, as well as the ongoing challenge to assess metacognition/SRL and its implementation by teachers and schools. The five contributions provide innovative insights into new directions that research on metacognition and SRL could take and will be followed by a discussion with the audience.

Looking Backwards to Move Forward: Missed Opportunities in Developing Metacognition and SRL Theory
Presenting Author: Daniel Dinsmore, University of North Florida, United States; **Co-Author:**Meghan Parkinson, University of North Florida, United States

The purpose of this presentation is to examine theories and models of metacognition and self-regulated learning (SRL) to better conceptualize better theory development moving forward as well as how these theories can inform practice. Specifically, we examine the lack of integration or unification in these theories and examine why the development of metacognition and SRL has not been a stronger focus. This analysis is framed by Kuhn’s attributes of good theory as well as the types of theories laid out by Gigerenzer and colleagues. Overall, theories of metacognition and SRL are not well integrated (i.e., there are still a diverse range of theories with significantly different assumptions) and due to the theories being built on empirical works – rather than the other way around – theory development is still weak in these areas. An exemplar is given integrating a model of SRL (i.e., Winne & Hadwin’s COPES model) and a developmental model

of expertise (i.e., Alexander's Model of Domain Learning).

SRL and emotions: Social and emotional factors in metacognition in the age of AI
Presenting Author: Sanna Järvelä, University of Oulu, Finland; **Co-Author:**Márta Sobocinski, University of Oulu, Finland; **Co-Author:**Andy (Khanh Xuan) Nguyen, University of Oulu, Finland; **Co-Author:**Hanna Jarvenoja, University of Oulu, Finland

The aim of this paper is to discuss social and emotional factors in research on metacognition using artificial intelligence (AI) and multimodal data for understanding self-regulated learning processes. We present two studies to demonstrate our progress in that research and discuss how it can contribute to future research. In study 1 we investigated markers that indicate both successful regulation, and lack of regulation in moments when regulation should have been triggered but it failed to be. In the study *2* we detected and modelled SSRL with multimodal data and AI. We argue that researchers and practitioners could benefit from methodological development incorporating human-AI collaboration for capturing, processing, and analysing multimodal data to examine and support social and emotional processes in learning.

Looking into the future of metacognition and SRL research in early childhood
Presenting Author: Deborah Pino-Pasternak, University of Canberra, Australia

The past decades have seen significant advances in the understanding of metacognition and SRL development in young learners. We now accept that precursors of metacognitive activity and SRL emerge much earlier than previously accepted, we have grown to understand the role that significant adults and peers play on this development, and we recognize the long term implications of young children developing as self-regulated learners into the future. Despite such progress, some issues remain elusive for researchers, while other gaps emerge as locally and globally, humanity experiences both steady and dramatic changes. This paper presents a thematic discussion informed by literature published since 2010 to unpack what is yet to be better understood in the investigation of young children's metacognition and SRL. In this paper we argue that advances in developmental research and measurement are still required to disentangle longitudinal associations between higher order cognitive functions like executive functions, metacognition and self-regulated learning during the first years of life. From a socio-cultural perspective, as educational environments become more diverse and technology-based, our understanding of metacognition and SRL development ought to reflect the richness and complexity of such contexts. Lastly, this paper makes a call for researchers to examine affective processes that influence how young children access (or not) executive processes that underpin metacognition and SRL. As more and more young children grow in contexts of displacement, conflict, climate change and health emergencies, understanding the connections between trauma and SRL has become critical, particularly for the end users of our research endeavours.

From Intervention to Collaboration: Researchers Working With Teachers to Advance SRL in Classrooms
Presenting Author: Nancy Perry, University of British Columbia, Canada

In this presentation, I will use examples from my research on self-regulated learning (SRL) to promote participatory approaches as one way to close gaps between theory/research and practice. In particular, I will focus on how collaborations, rather than researcher-led interventions, support the development of robust, ecologically valid, and sustainable supports for SRL in classrooms. I will describe researchers partnering with teachers and engaging in collaborative inquiry to design and implement supports for students' SRL and argue the goal of increasing opportunities for SRL in classrooms requires researchers attend to teachers' learning about SRL and also to their guidance about how to make interventions work in diverse settings and situations.

Assessing SRL and SRL implementation: A matter of multi?
Presenting Author: Hilde Van Keer, Ghent University, Belgium

There is general consensus on the importance of self-regulated learning (SRL) and SRL implementation. At the same time, there is also concern that a large number of students experience persistent difficulties with SRL and that teachers and schools struggle with adequate SRL implementation to support learners' in their development. To alter this, it is first and foremost important to be able to accurately capture the complexity of SRL in learners in a reliable and valid way, as well as to map SRL implementation by teachers in daily classroom and school practice. This brings us to assessment issues in the literature and evolving traditions, confronting us with actual challenges we should address to help the field move forward. In this respect, the presentation will aim at positioning challenges both in the field of assessing learners' SRL as in the field of assessing teachers' and schools' SRL implementation and at reflecting on potential avenues for the future.

Session K 2

24 August 2023 17:00 - 18:30
AUTH_DC2
Invited Symposium
Higher Education

Transitions in researcher education and careers

Keywords: Competencies, Doctoral Education, Emotion and Affect, Higher Education, Informal Learning, Lifelong Learning, Metacognition, Researcher Education, Self-determination, Synergies between Learning / Teaching and Research
Interest group: SIG 24 - Researcher Education and Careers
Chairperson: Erika Löfström, University of Helsinki, Finland
Organiser: Erika Löfström, University of Helsinki, Finland
Discussant: James Burford, University of Warwick, United Kingdom

The growing scope and quality of the exchanges between research, researchers, and various professional and societal actors push for, but also enable, new forms of researcher transitions between institutional, professional, and societal contexts. Transitions involve career progression, and identity shifts. They involve moving in and out of academia, and they may be temporal and spatial. The increased mobility in researcher education and careers create transitions between national and cultural contexts. This symposium explores transitions in the PhD, post PhD, and mid-career/seniority transitions. It continues to bring forth the collaboration of SIG 24 members on the theme of transitions in researcher education and careers started in the SIG 24 bi-annual meeting in 2022.

Transitions in the PhD
Presenting Author:Søren Bengtsen, Aarhus University, Denmark; **Presenting Author:**Kelsey Inouye, University of Oxford, United Kingdom; **Co-Author:**Patrícia Alves, University of Porto, Portugal; **Co-Author:**James Burford, University of Warwick, United Kingdom; **Co-Author:**Montserrat Castelló Badia, Blanquerna, Universitat Ramon Llull, Spain; **Co-Author:**Dely Elliot, University of Glasgow, United Kingdom; **Co-Author:**Liezel Frick, Stellenbosch University, South Africa; **Co-Author:**Sofie Kobayashi, University of Copenhagen, Denmark; **Co-Author:**Lynn McAlpine, University of Oxford / McGill University, Canada; **Co-Author:**Paula Meesters, University Utrecht, Netherlands; **Co-Author:**Hatice Nuriler, Aarhus University, United Kingdom; **Co-Author:**Signe Skov, Aarhus University, Denmark

In this presentation, we explore how transitions in the PhD get shaped by shifts at macro (societal), meso (policy and positionality) and micro contexts interacting with individual experiences, intentions and affect/emotion. The presentation explores tensions and interactions between individual and structural contexts, and how transitions involve time, place and mobility. We analyze and discuss the transitions in the PhD from two major themes: 'meaning and value of research', and 'emotion, affect and well-being'. We discuss how our own approach has emerged from an awareness that there has been over time a transition in the PhD from a predominant focus on cognitive, rational, and individual approaches toward an increasing interest in emotions, bodies, relations and wellbeing.

Potentials, challenges, uncertainties: Cross-cultural transitions in doctoral/post-doctoral context
Presenting Author: Dely Elliot, University of Glasgow, United Kingdom

Cross-cultural studies often carry a sense of mystique about what lies ahead resulting from mixed experiences of deliberate and serendipitous cultural

interactions during the sojourn. The continuing and steady surge in the number of scholars and early career researchers who travel overseas in pursuit of doctoral or post-doctoral education as well as those many others who while remaining at home, also find themselves working in close proximity with these international scholars, arguably make this area both a fascinating and a crucial area of study. By offering a newly proposed model for understanding what may underpin the quality of international scholars' experience based on metacognition and Self-Determination Theory, I will aim to elucidate the inherent potential, challenges and uncertainties embedded in the sojourn. In particular, I will discuss, the roles of intercultural engagement, intercultural competence and intercultural relations – regarded as extra routes by default in every international scholarly journey. I will use various exemplars from other empirical studies to discuss and elaborate on this model, with a view to pursuing not only successful PhD completion or a successful career, but also in achieving a transformative experience and sustaining sound psychological well-being for these scholars. Overall, I will highlight how holistic international doctoral or postdoctoral development can be fostered to bring hope and help manage transitions and uncertainties more effectively.

Academic mid and late career transitions and supervision
Presenting Author: Irene Lokhtina, University of Central Lancashire Cyprus, Cyprus; **Presenting Author:**Solveig Cornér, University of Helsinki, Finland; **Co-Author:**Cecilia Almlöv, Swedish University of Agricultural Sciences, Sweden; **Co-Author:**Erika Löfström, University of Helsinki, Finland; **Co-Author:**Kirsi Pyhältö, University of Helsinki, Finland; **Co-Author:**Henrik Viberg, Swedish University of Agricultural Sciences, Sweden; **Co-Author:**Paula Meesters, University Utrecht, Netherlands

The aim of this presentation is to synthesise research on academic careers especially at the stage of transition to mid-career and senior positions. This presentation highlights insights from the extant research base on transitions viewed from the perspective of later career stages and brings in examples from SIG 24 members' own and collaborative research. The presentation evolves around the themes of supervisor learning, institutional guidelines on supervision, and mid and late career transitions as triggers for a possible identity shift. The collected research informs on how to create and facilitate institutional supportive conditions and mechanisms including the provision of learning and training opportunities at different systemic levels in order for academics to stay resilient and be prepared to successfully manage career transitions.

Transitions in post-PhD careers
Presenting Author: Inge Van der weijden, Leiden University, Netherlands; **Co-Author:**Isabelle Skakni, University of Applied Sciences and Arts Western Switzerland, Switzerland; **Co-Author:**Anna Sala Bubaré, Ramon Llull University, Spain

This presentation focuses on the transitions experienced by individuals after obtaining a PhD degree. As traditional academic career tracks are becoming scarcer everywhere, diversity in PhD holders' careers has dramatically increased, especially for recent graduates. We first present the preliminary results of ongoing empirical studies about post-PhD transitions, from three complementary perspectives: 1) institutional mechanisms supporting PhD candidates' preparation for various careers, 2) PhD holders' hybrid careers and 3) employers' perceptions of the added value of PhD holders for their organisations. Then, we discuss our findings' implications for doctoral education and career development services, and we identify gaps and challenges for future research.

Session K 3

24 August 2023 17:00 - 18:30
UOM_A08
Symposium
Learning and Social Interaction, Motivational, Social and Affective Processes

Interest on the Move

Keywords: Developmental Processes, Engagement, Informal Learning, Interest, Science and STEM, Social Aspects of Learning and Teaching, Social Interaction, Sustainable Development
Interest group: SIG 10 - Social Interaction in Learning and Instruction
Chairperson: Sanne Akkerman, Utrecht University, Netherlands
Organiser: Sanne Akkerman, Utrecht University, Netherlands
Discussant: Roger Saljo, University of Gothenburg, Sweden

Although frequently studied as such, learning is not isolated in single and dedicated educational contexts. This particularly yields for interest-based learning that can involve systematic pursuits of students across school, home, peers and leisure to engage in particular topics or activities of interest. Whereas we can assume interests to move and develop across contexts on a daily basis, we still have very little understanding of how this occurs. This insight is even more urgent given the increasing collaborations and partnerships of educational institutions to support life-wide development and societal engagement, often by centering on students' personal interests. This symposium bundles studies that aim to better understand interest development of students as naturally occurring in and beyond educational practice. The first paper examines on a large scale how students' parallel interests develop dynamically over three years of time, with notable variations in explorations and experience of interest. The second paper examines variations and fluctuations in how interest engagement is contextually structured, with different temporal, spatial, material and social structures. The third and fourth paper complement the first two life-wide studies by examining extra-curricular settings that form targeted transformative spaces for development of interests in relation to respectively STEM and community projects. The studies share ecological methodologies that center student experience and engagement in practice and that trace objects of interest beyond predefined disciplinary categories and curricula. The discussant is invited to reflect on implications of findings on how we are to think about education and might pursue further educational research.

Developmental dynamics of multiple interests
Presenting Author: Jael Draijer, University Utrecht, Netherlands; **Co-Author:**Larike Bronkhorst, Utrecht University, Netherlands; **Co-Author:**Sanne Akkerman, Utrecht University, Netherlands

Whereas existing interest development theories typically describe development of a single interest in a single context, findings in person-centered research strongly suggest that interest development may be more complex than that because of the idiosyncrasy, multiplicity and experientiality of interest. The current study thus explores how adolescents' interests develop in and across daily life contexts, asking 309 students from diverse educational tracks to use an experience sampling method (ESM) for 10 weeks, spread out over three years. In addition, 48 of these students are interviewed each year. Findings from growth mixture modeling extend our knowledge by showing how some adolescents specialize in their interests, whereas others pursue a select set of interests over time. Analysis of the interviews demonstrates that interest reflects not only a process of deepening, but also of broadening and connecting with other interests. Qualitative analysis of the open ESM data shows that experiencing interest in the moment is not guaranteed, even for longstanding objects of interest. This implies that development is not a linear process and continuation of an interest might be hard to predict. Results suggest revising existing interest support in classrooms, by moving towards more personalized, adolescent-driven interest support.

Developing interest pursuits during educational transitions
Presenting Author: Joris Beek, University Utrecht, Netherlands; **Co-Author:**Larike Bronkhorst, Utrecht University, Netherlands; **Co-Author:**Sanne Akkerman, Utrecht University, Netherlands

Pursuing interest can be viewed as a form of learning, with interests leading to a wealth of positive (educational) outcomes for adolescents. Pursuing interest is increasingly recognized as inherently contextual, not only for novel interests (conceptualized as 'situational'), but also for interests sustained over a longer period (conceptualized as 'individual'). The extent to which the contextuality of interest pursuits is 'a given' or susceptible to (life) changes, remains to be explored. Studying the dynamics of contextuality of adolescents interest pursuits during an educational transition will increase understanding that informs policy makers, parents, and educational practitioners about how their support of adolescents' interests features in wider interest configurations. We studied 410 adolescents' two most important, self-defined interests (N=820) along seven dimensions (epistemic, temporal, geographical, material, institutional, cultural and social) informative for the contextuality of their interest pursuit prior, during, and after an educational transition. Using person-centred analyses (i.e. Latent-Profile

Analyses and Latent-Transition Analyses) we identified structures of interest pursuits and analysed transitions between structures over time. The same four structural configurations were identified at each timepoint, indicating qualitative differences between interest pursuits. Over time, most interests are pursued within the same structural configurations. Observed changes within developing interest pursuits imply large changes illustrating the individuality of pursuing interests. More stable interest pursuits may illustrate more pressing demands, as called for by the object or by interest-related norms in larger society. Combined, (large) changes and mostly stable pursuits show how interests are both individual and collective.

Tracing objects of interest from school to out-of-school
Presenting Author: Jaakko Hilppö, University of Helsinki, Finland

Building on a cultural-historical activity theory and practice theory perspectives (Engeström, 1987; Azevedo, 2011) on human activities and interest, this study focuses on students' interest-driven engagement across different contexts. More specifically, drawing on two independent long-term ethnographic case studies of students' interest development in the US. and Finland, I argue that the object of the students interest changes over time. Through interactional and grounded theory methods (Jordan & Henderson, 1995; Strauss, 1987), the on-going analysis of the study shows that the student's object of interest progressed through a succession of multiple different articulations. Together the preliminary results suggest that with expansion of students' interests to new contexts (like from school to home), what constitutes the object of their interest can also change.

From interest to commitment towards sustainability. A critical psychology perspective.
Presenting Author: Alfredo Jornet, Universitat de Girona, Spain

Youth have become a key character in discussions about sustainability and are often portrayed as leading voice in the transition towards more just and environmental societies. Yet, despite a growing number of projects aimed at empowering students to become agents of change, we know very little about how and to what extent students engage in relevant action towards sustainability, or how their actual engagement relates to learning in and across multiple school and non-school settings. Through our research, we have documented how there is no such thing as a uniform way of being interested, and that being young in the 2020s does not necessarily involve an inherent interest in the topic. In this paper, we present and discuss our research on upper secondary students' interest and engagement in climate change. We take a critical psychology perspective according to which interest is intimately related to political commitment and *agency,* defined as the human capacity to gain, in cooperation with others, control over each individual's own life conditions. We draw on ethnographic materials from a three-years European project on open schooling, where schools collaborate with the out-of-school actors in their local communities to address local sustainability challenges. We follow the *learning lives* of six upper secondary students from three different schools. Our analyses focus on the narratives that these students mobilize to make sense of ongoing activities and envisioned futures, and the extent to which these allow them positioning themselves as committed *historical actors* in the struggle towards a more sustainable future.

Session K 4

24 August 2023 17:00 - 18:30
UOM_A03
Symposium
Assessment and Evaluation

Teachers' wellbeing, social self-efficacy, burnout and job-satisfaction in ECE across four countries

Keywords: Attitudes and Beliefs, Burnout, Early Childhood Education, Quantitative Methods, Social Interaction, Teacher Efficacy, Teacher Professional Development, Well-being
Interest group: SIG 05 - Learning and Development in Early Childhood
Chairperson: Vasileios Grammatikopoulos, Greece
Organiser: Anastasia Vatou, Greece
Discussant: Eleni Tympa, Greece

"Promoting Teachers Well-being through Positive Behavior Support in Early Childhood Education" (ProW) is an ERASMUS+ Key Action 3 Policy Experimentation program which is funded by the European Union (Project Number: 626146-EPP-1-2020-2-EL-EPPKA3-PI-POLICY). This intervention program aims to improve teachers' well-being and careers, by developing a safe and positive preschool climate in which children's socio-emotional competencies are promoted. Promoting teachers' well-being by using the Positive Education (PERMA model) and the School Wide Positive Behaviour Support (SWPBS) frameworks could build and support mental and physical well-being in early childhood education settings. This symposium brings together findings from a research project involving Cyprus, Greece, Portugal, and Romania. The symposium will start by a brief overview of the general goals and methods used. Then four short papers will be presented addressing specific questions across countries: Paper 1 will examine differences on teachers' wellbeing across the four countries. Paper 2 will focus on the differences on teachers' social self-efficacy across the four countries. Paper 3 will present teachers' perceptions about their levels of burnout and teachers' job satisfaction (Paper 4) across the four countries. The discussion will take an international perspective to provide evidence to educational practitioners for the implementation of effective professional development programs across different countries.

Testing the Construct Validity and Cross-Country Comparability of a Teacher Wellbeing Measure
Presenting Author: Demos Michael, Center for the Advancement of Research & Development in Educational Technology (CARDET), Cyprus; **Co-Author:**Andri Agathokleous, Institute of Development, Cyprus; **Co-Author:**Vicky Charalambous Charalambous, Institute of Development, Cyprus; **Co-Author:**Christos Pezirkianidis, Department of Psychology, Greece; **Co-Author:**Charalambos Vrasidas, CARDET - University of Nicosia, Cyprus

Teacher wellbeing is increasingly gaining scientific and political interest as being associated with job satisfaction, teacher retention, quality of teaching and student outcomes. Different conceptualizations and measures for teacher wellbeing exist in the literature making its international examination and applied use complicated. In this respect, the development of universally reliable and valid measures is essential to design effective interventions and promote it in practice. This study examines the validity and cross-country comparability of the Teacher Subjective Wellbeing Questionnaire (TSWQ) in four European countries (i.e., Cyprus, Greece, Portugal, and Romania). The measure was administered to 393 ECEC teachers in total. Different validation techniques were employed to assess the TSWQ's construct validity and equivalence across sample countries. The results confirmed the factorial structure of the scale in all countries, which suggests two dimensions i.e., teacher efficacy and connectedness. The measure has good psychometric properties in all settings, and it is potentially helpful for future studies. However, measurement invariance analyses revealed that TSWQ is not necessarily invariant and equivalent across the groups of the current study. These results might indicate that the investigation of wellbeing implies further theoretical and methodological developments with measures that respond similarly to contextual and cultural differences.

Teachers' social self-efficacy in cross-national perspective
Presenting Author: Anastasia Vatou, International Hellenic University, Greece; **Co-Author:**George Manolitsis, University of Crete, Greece; **Co-Author:**Maria Evangelou-Tsitiridou, International Hellenic University, Greece; **Co-Author:**Vasilios Oikonomides, University of Crete, Greece; **Co-Author:**Maria Kypriotaki, University of Crete, Greece; **Co-Author:**Angeliki Mouzaki, University of Crete, Greece; **Co-Author:**Evridiki Zachopoulou, International Hellenic University, Greece; **Co-Author:**Vasileios Grammatikopoulos, International Hellenic University, Greece

The importance of teachers' self-efficacy, both for teachers' wellbeing and the overall quality of teaching is well established in the context of Early Childhood Education and Care (ECEC) (Guo et al., 2014; Höltge et al., 2019; Klassen & Chiu, 2010). Teachers' social self-efficacy – beliefs teachers hold that they can develop and maintain positive relationships with children (Vatou et al., 2022) – has been shown to contribute on their interpersonal interactions with their children. Teacher-child relationships quality is often mentioned as one of the core reasons for staying in the profession (Hargreaves, 1998; O'Connor, 2010). The purpose of this study was twofold. The first aim was to test the validity of the Teacher Social Self-efficacy Scale (TSSES) in four ECEC settings – Greece, Cyprus, Portugal, and the Romania. The second purpose was, by extension, to determine the importance of the teachers' social self-efficacy construct across different ECEC settings. The sample included 396 participants from Greece (N = 93), Cyprus (N = 96), Portugal (N = 95), and Romania (N = 109). The

TSSES showed convincing evidence of reliability and measurement invariance across the four countries. Results also showed mean score differences of teachers' social self-efficacy across countries. The findings are relevant to policy makers, practitioners and education researchers.

Burnout in early childhood education: cross-cultural factorial validity of MBI-ES
Presenting Author: Ana Rodrigues de Lemos, Faculty of Psychology and Educational Sciences of the University of Porto, Portugal; **Co-Author:**Filipe Piedade, University of Porto, Portugal; **Co-Author:**Tiago Ferreira, University of Porto, Portugal; **Co-Author:**Carolina Guedes, University of Porto, Portugal; **Co-Author:**Teresa Leal, University of Porto, Portugal; **Co-Author:**Catarina Grande, University of Porto, Portugal; **Co-Author:**Diana Alves, University of Porto, Portugal; **Co-Author:**Joana Cadima, University of Porto, Portugal

Worldwide, several authors have recently highlighted that teacher job burnout, a psychological syndrome that emerges in response to chronic interpersonal stressors on the job (Maslach et al., 2001), is a work-related phenomenon that can have serious consequences on children and staff (Madigan & Kim, 2021, 2021a). The Maslach Burnout Inventory - Educators Survey (MBI-ES) is the most widely used scale in educational settings (Aboagye et al., 2018; Hawrot & Koriewski, 2018; Worley et al., 2008). However, this scale has revealed divergent results in factorial validity analysis across countries, calling for further cross-cultural research. In this study, we aim to test the factorial structure of MBI-ES across four European countries – Cyprus, Greece, Portugal, and Romania. Participants were 391 early childhood education professionals from the four countries, who completed the 22-item version of MBI-ES. Confirmatory Factor Analysis (CFA) was conducted to test the model fit of 1- and 2-factor structures, using the *MPlus* software. To test the cross-cultural factorial structure of MBI-ES, a multigroup CFA was conducted, using the MLR estimator to address the non-normal distribution of the data. Preliminary analyses and descriptive statistics at the item level suggested that burnout levels were generally low, with several items (belonging to the depersonalization subscale) highly skewed, resulting in significant item reduction. Although the 2-factor structure with the remaining 16 items showed acceptable fit, results from the multi-group analyses suggested several specific-country patterns. Findings will be discussed considering the specificities of working in early childhood education contexts in each participating country.

Early childhood teachers' job-satisfaction across four countries
Presenting Author: Demos Michael, Center for the Advancement of Research & Development in Educational Technology (CARDET), Cyprus; **Co-Author:**Anastasia Vatou, International Hellenic University, Greece; **Co-Author:**Katerina Krousorati, International Hellenic University, Greece; **Co-Author:**Vicky Charalambous, Institute of Development, Cyprus; **Co-Author:**Maria Evangelou-Tsitiridou, International Hellenic University, Greece; **Co-Author:**Charalambos Vrasidas, CARDET - University of Nicosia, Cyprus; **Co-Author:**Evridiki Zachopoulou, International Hellenic University, Greece; **Co-Author:**Vasileios Grammatikopoulos, International Hellenic University, Greece

The importance of teachers' role for students' learning and development is widely recognized, and the question whether teachers are commitment and satisfy with their teaching profession is often overlooked (Liang & Akiba, 2017). Research evidence showed that positive organizational climate, job autonomy, collective efficacy and job satisfaction are associated with high-quality provision and teachers' satisfaction (Aboagye et al., 2020; Penttinen et al., 2020; Vatou & Vatou, 2019). Research suggests that the possibility of teacher attrition is lessened when teachers are satisfied with their jobs (Skaalvik & Skaalvik, 2011). The study's aims were a) to test the validity of the Employee Satisfaction Inventory (ESI; Koustelios & Bagiatis, 1997) in four ECEC settings – Greece, Cyprus, Portugal, and Romania - and b) to compare the early childhood education teachers' levels of job satisfaction across these countries. The sample included 396 participants from Greece ($N = 93$), Cyprus ($N = 96$), Portugal ($N = 95$), and Romania ($N = 109$). A series of factor analyses were used to investigate ESI's cross-cultural validity. The ESI showed convincing evidence of reliability across the four countries. Results also showed mean score differences of teachers' job satisfaction across countries. This study concludes by offering implications for teachers, practitioners, and education researchers as well as for the teacher job satisfaction literature.

Session K 5

24 August 2023 17:00 - 18:30
AUTH_TE2
Symposium
Learning and Special Education

Let's play – social play as mean and goal for learning in inclusive education

Keywords: Cooperative/Collaborative Learning, Engagement, Inclusive Education, Peer Interaction, Social Interaction, Special Education
Interest group: SIG 15 - Special Educational Needs
Chairperson: Lucas Deutzmann, University of Potsdam, Germany
Organiser: Florianne Rademaker, University of Groningen, Netherlands
Organiser: Maria Gladh, Stockholm University, Sweden
Organiser: Hanna Ginner Hau, Stockholm University, Sweden
Organiser: Winnie-Karen Giera, Germany
Discussant: Elisa Kupers, University of Groningen, Netherlands

Social play provides an important context in which children can acquire various cognitive, language, and social skills (Lillard et al., 2013). The relationship between play, child development, and learning has been extensively researched, and the fundamental role of play in children's development and learning has been highlighted (i.e., Hirsh-Pasek et al., 2010). Furthermore, play increases the likelihood of learning within inclusive education settings for children with disabilities or special educational needs (SEN) (e.g., Morrison et al., 2002). Yet, children with disabilities or SEN have been shown to engage less in social play than their typically developing peers (i.e., Chen et al., 2019), which may limit their opportunities for development and learning. This symposium contains presentations of four play-based interventions, spanning from early childhood to secondary education and focusing on various perspectives of how playful learning can promote participation, engagement, and involvement. From the perspective of a multi-tiered model of special education the play-based interventions presented in the symposium target the entire classroom or even school (tier 1) as well as promoting various skills for children with disabilities or SEN (tier 2 and 3). From this perspective, and based on the interventions presented in the symposium, the importance of social play as both mean and goal for inclusive education in uncertain times is discussed. Furthermore, the symposium raises issues about the implementation of interventions in complex contexts.

Disabled in play? A multiple case study on SEN students' engagement in cooperative play activities
Presenting Author: Florianne Rademaker, University of Groningen, Netherlands; **Co-Author:**Elisa Kupers, University of Groningen, Netherlands

The social participation of SEN students is lagging behind (e.g., Garrote, 2017). Several authors have suggested that promoting positive contact between students with and without SEN can serve as an important intervention strategy and proposed cooperative learning as a suitable method (e.g., Pinto et al., 2019). Effects of cooperative learning on the social participation of SEN students depend on how cooperative learning is implemented (O'Connor & Jenkins, 2013). The Contact Theory's conditions for optimal contact (i.e., intergroup cooperation, common goals, equal status, and support by authorities; Allport, 1954) might be crucial for achieving positive effects. Therefore, it is important to study how students interact with each other during these kinds of interventions. This multiple case study investigated whether the conditions intergroup cooperation and equal status were met during cooperative play activities of the 'Everybody Belongs!' intervention. Two cooperative learning groups consisting of one student with an intellectual disability (ID) and three typically developing peers (4-6 years) were observed with a detailed systematic coding scheme of their moment-to-moment interpersonal behavior. The results indicate that students with ID were less engaged in the activities and more submissive than their typically developing peers. Both groups demonstrated high proportions of affiliative interactions, however, peers did not react to the students with ID in at least 50% of the interactions. This indicates that neither intergroup cooperation nor equal status was present during the cooperative play activities. Future research could look into better ways to promote intergroup cooperation and equal status in mixed-ability cooperative learning groups.

Studying a peer-based intervention to test the concept of explicit teaching social play skills

Presenting Author: Maria Gladh, Stockholm University, Sweden; **Co-Author:**Eva Siljehag, Department of Special Education, Stockholm University, Sweden; **Co-Author:**Mara Westling Allodi, Stockholm University, Sweden; **Co-Author:**Samuel L. Odom, Frank Porter Graham Child Development Institute, Chapel Hill School of Education, University of North Carolina, Chapel Hill, NC, United States

Some preschoolers may risk being less involved in play with peers, due to disabilities, other special educational needs (SEN), and non-adapted learning environments. Peer-based interventions and instructions (PBIIs) are complementary inclusive teaching methods. By using these, teachers can promote children's social skills and increase their social play participation. However, the outcomes of such interventions may vary for different children. To evaluate their effectiveness, researchers also need to consider the implementation contexts. Based on a holistic view of learning and development, preschools might contrast teaching and play. To test the concept and feasibility of explicitly teaching social play skills by using the PBII Play Time/Social Time (PT/ST), we conducted two multiple case studies in four Swedish preschools. PT/ST contains 28 learning activities including play, addressing social skills significant for play interactions and friendships. Four teachers implemented PT/ST in their settings. At each preschool, one child with a disability or other SEN (n = 4) and one or two socially skilled peers (n = 6) participated. We triangulated data from observational assessments, video observations, a group interview, teacher logbooks, audio-recorded coaching dialogues, and field notes. The results indicate that the teacher's implementation of PT/ST enabled the children to engage in social play and use social skills. Preliminary results also indicate that the teachers could adapt the intervention to their practice, by staging learning activities for social play, and instructing and scaffolding the children to use social skills and play together. The presentation will discuss the didactic dimension of implementing PBIIs.

Everyone is playing! A participatory theater project to promote reading competence
Presenting Author: Winnie-Karen Giera, Institute of German Studies, University of Potsdam, Germany; **Co-Author:**Sara Hauser, Institute of German Studies, University of Potsdam, Germany

Reading literacy is "the ability to understand, use, evaluate, reflect on, and engage with texts in order to achieve one's own goals, develop one's own knowledge and potential, and participate actively in society" (OECD, 2019: 38). Many students do not yet have secure reading skills by the age of 15 (ibid). For example, nearly one-third of adolescents in non-gymnasium schools lack the ability to compose and reflect on the meaning of texts, specially in non-high school settings. Yet, various models of reading literacy show how important this skill is in turn, as a lack of literacy skills leads to barriers in educational progression (Stanat et al., 2010). A play, on the other hand, enables the activation and thus participation of all due to the high action orientation through scenic play and the openness to results in the staging. According to Rosebrock & Nix` reading model (2015), playful engagement with a play leads to local and global coherence at the process level, participation at the subject level, and peer interaction at the social level. That led us to our research question in two schools: how can a theater project promote literacy and social interaction? We handle in terms of the RTI approach to identify reading levels and compare them prior and after theater intervention (LGVT 5-12; SLS 2-9). Added questionnaires to measure the self-efficacy (Jerusalem & Schwarzer, 1999), and social interaction, show in the qualitative and quantitative data improvements in social interaction, and reading competence.

Guided play and narrative skills - promoting participation and engagement for each child
Presenting Author: Hanna Ginner Hau, Stockholm University, Sweden; **Co-Author:**Heidi Selenius, Stockholm University, Sweden; **Co-Author:**David Backlund, Department of Special Education, Stockholm University, Sweden

This study explores teachers' perspectives on how using guided play as a method to promote narrative skills might influence participation and engagement also for children that have challenges in developing these skill*s.* Narrative skills refer to retelling an event or creating a story coherently and meaningfully. These skills are important for participation and communication but also for students' school achievement. Students with weak oral narrative skills will struggle with writing. Playful writing is a universal play-based intervention that promotes narrative skills (Whitebread & Basilio, 2016). It provides multimodal facilitators for developing narrative skills and is based on shared experiences in the classroom. For example, after the teacher has read a story, the students will construct the story together with Lego or other concrete materials. By talking about and constructing the story, the students are given the opportunity to develop vocabulary and retelling skills. The Lego construction also provides visual support, which facilitates narrative skills. Each student then creates their own story orally or in writing based on the Lego constructions and the conversations with their classmates. This study explores teachers' experiences of Playful Writing's potential for promoting participation, engagement, and involvement for each child in the classroom. Data were collected in focus groups with pedagogues, and the material was analyzed with thematic analysis. Our findings indicate that from the teachers' perspective building joint Lego construction of stories contributes to engagement and involvement, as well as to students' practice of social skills, and everyone contributes in their own way.

Session K 6

24 August 2023 17:00 - 18:30
AUTH_T002
Symposium
Cognitive Science

New perspectives in unraveling the difficulties in fraction understanding

Keywords: Cognitive Development, Cognitive Skills and Processes, Conceptual Change, Mathematics/Numeracy, Misconceptions
Interest group: SIG 03 - Conceptual Change
Chairperson: Wim Van Dooren, KU LEUVEN, Belgium
Organiser: Wim Van Dooren, KU LEUVEN, Belgium
Organiser: Jo Van Hoof, University of Turku, Finland
Discussant: Xenia Vamvakoussi, University of Ioannina, Greece

Fraction understanding has been shown to be crucial for the learning of later mathematical topics, such as algebra. Still, they form a major stumbling block in education. While the topic of the teaching and learning of fractions has attracted the interest of mathematics educators already for decades, it also came a focal point of attention of educational and cognitive psychologists only rather recently. This symposium brings together groups from these three communities, and addresses some major insights gained in the last years, as well as research methods that led to revealing these insights. A first main idea – addressed in the first study – is that the magnitude of fractions is not necessarily represented in the same way as other numbers. The second study goes deeper into this issue by pointing out how various subgroups of learners have qualitatively different ways of determining fraction magnitudes, and provide a statistical method to disentangle them. The third paper focuses on inhibition as one of the important cognitive processes underlying a major obstacle in understanding fraction magnitude, i.e. the natural number bias. The fourth study, finally, points at the role of affective elements in this process, i.e. mathematics anxiety.

Equivalent fractions are not equal on the mental number line
Presenting Author: Georgios Thoma, Loughborough University, United Kingdom; **Co-Author:**Julia Bahnmueller, Loughborough University, United Kingdom; **Co-Author:**Jessica Maisey, Tampere University, Finland; **Co-Author:**Antero Lindstedt, Tampere University, Finland; **Co-Author:**Kristian Kiili, Tampere University, Finland; **Co-Author:**Manuel Ninaus, University of Graz, Austria; **Co-Author:**Korbinian Moeller, Loughborough University, United Kingdom

Recent research indicates that fraction magnitude understanding is an important predictor of later math achievement. However, there is only limited evidence on the aspect of fraction equivalence. The objective of the current study was to evaluate participants' number line estimation performance for pairs of equivalent (i.e.,1/2 and 2/4) and identical fractions (i.e., 1/2 and 1/2). Both sets of fraction stimuli were presented in both a game and a non-game task version. We hypothesized that the difference in estimating two equivalent fractions should be significantly larger than the difference in estimating the same fraction twice. However, results did not substantiate this expectation as there were no significant differences between estimation performance of equivalent and identical fractions - nor between the game and non-game task version. These findings suggest that for our adult participants equivalent fractions were associated with the same location on the mental number line. Follow-up studies with children just learning about fractions would be desirable to evaluate the emerging understanding of fraction equivalence.

The roles of magnitude processing, biases, and benchmarking in fraction comparison tasks

Presenting Author: Timo Leuders, University of Education Freiburg, Germany; **Presenting Author:**Katharina Loibl, University of Education Freiburg, Germany; **Co-Author:**Frank Reinhold, University of Education Freiburg, Germany

Research on fraction comparison shows that students typically follow clear and replicable biased patterns (e.g., natural number bias, i.e., 4/9 > 2/3, because 4 > 2 and 9 > 3). However, the role of benchmarking (e.g., 4/9

Inhibition in the processing of rational numbers: A correlational study with fifth graders
Presenting Author: Karen De Keersmaeker, KU Leuven, Belgium; **Co-Author:**Wim Van Dooren, KU Leuven, Belgium; **Co-Author:**Jo Van Hoof, University of Turku, Finland

Understanding rational numbers is difficult for many children. One of the many reasons that researchers give for these difficulties is the natural number bias, or the tendency to inappropriately apply natural number properties to rational numbers (Ni & Zhou, 2005). As children first encounter natural numbers, it is assumed that children create an idea of how numbers behave that is solely based on experiences with natural numbers (Gelman, 2000; Greer, 2004). However, this can lead to incorrect answers as the properties of natural and rational numbers differ (Van Hoof et al., 2017). We argue that at the point where children have acquired the correct insight, this may co-exist with the initial natural number-based ideas. Thus, in some cases children need to inhibit their ideas of natural numbers when processing rational numbers. Hence, we investigated if children with better inhibitory skills also showed less traces of the natural number bias when solving tasks involving decimal and fraction comparison. Contrary to other studies in this field, we failed to find strong evidence for the relationship between inhibition and the natural number bias. Possible explanations for the contradicting findings will be discussed.

The link between conceptual change and mathematics anxiety: the case of fractions
Presenting Author: Jo Van Hoof, University of Turku, Finland; **Co-Author:**Hilma Halme, University of Turku, Finland; **Co-Author:**Minna Hannula-Sormunen, University of Turku, Finland; **Co-Author:**Jake McMullen, University of Turku, Finland

Fractions form a stumbling block in education. While there are several reasons why, ample research concluded that many learners apply natural number properties in fraction tasks, even when this is inappropriate. This phenomenon is called the natural number bias (NNB) and results in systematic mistakes, such as adding numerators/denominators separately in fraction addition tasks (e.g., 1/4 +1/3 = 2/7).
Recently, it was proposed that the NNB might influence the relation between mathematics performance and mathematics anxiety. The present longitudinal study investigates, for the first time, the influence of an increased conceptual fraction understanding on learners' fraction anxiety in a group of learners with a clear NNB profile. The hypothesis is that an increase in conceptual fraction understanding over time will increase fraction anxiety too, the reasoning being that learners become more aware of the mistakes they (used to) make and their lack of understanding. This realization can lead to higher fraction anxiety.
Results show that in a general group of fifth and sixth graders, an increased fraction understanding goes together with lower fraction anxiety. However, the opposite was found in learners with a very clear misconception, namely the natural number bias. In this group, increased fraction understanding led to increased fraction anxiety.
The present study has the implication that in mathematics anxiety research the qualitative different profiles of learners should be taken into account, with special attention to misconceptions, as increases in anxiety may occur during conceptual change.

Session K 7

24 August 2023 17:00 - 18:30
AUTH_CH
Symposium
Learning and Instructional Technology

Using digital tools and analytics to promote regulation in individual and collaborative learning

Keywords: Computer-assisted Learning, Cooperative/Collaborative Learning, Feedback, Instructional Design, Learning Analytics, Metacognition, Qualitative Methods, Reading, Self-regulated Learning and Behaviour
Interest group: SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Nikol Rummel, Ruhr University Bochum, Germany
Organiser: Nikol Rummel, Ruhr University Bochum, Germany
Organiser: Inge Molenaar, Radboud University Nijmegen, Netherlands
Discussant: Susanne Lajoie, McGill University, Canada

The aim of this symposium is to provide evidence-based insights into ways in which digital technologies can provide promising new ways to support self-regulation learning (SRL) in individual and collaborative settings. The first two contributions of the symposium focus on individual learning and on exploring possibilities for adaptive SRL support. Paper 1 asks how we can use learning analytics as a form of feedback to inform learners about their learning process in such a way they can use that information for effective self-regulated learning. Paper 2 focuses on the question whether automated feedback (using NLP) can improve learners' metacomprehension accuracy when learning from texts by providing additional feedback. In paper 3 the focus shifts to collaborative learning (CL). To regulate CL the members of a group need to collect feedback about past interaction and subsequently use this feedback to adapt the collaboration if necessary. The paper discusses group awareness tools as a way to provide groups with feedback on their collaboration and investigates boundary conditions under which groups may benefit from the tool-feedback and translate it into regulation. Finally, paper 4 addresses the research gap concerning the interplay between metacognitive and socio-emotional processes in regulating CL. In particular, the focus is on epistemic emotions (here: surprise). Our discussant will tie together the implications of the findings presented by the four papers with an eye of the role the technology may play in understanding and supporting (self)regulation of learning and, this way, also learning to self-regulate.

Designing feedback interventions with learning analytics: Identifying students' information needs
Presenting Author: Jacqueline Wong, Utrecht University, Netherlands; **Co-Author:**Ioana Jivet, Goethe University Frankfurt, Germany & DIPF, Germany; **Co-Author:**Manuel Valle Torre, Delft University of Technology, Netherlands; **Co-Author:**Gabrielle Martins Van Jaarsveld, Erasmus University Rotterdam, Netherlands; **Co-Author:**Ali Soleymani, Delft University of Technology, Netherlands; **Co-Author:**Martine Baars, Erasmus University Rotterdam, Netherlands; **Co-Author:**Marcus Specht, TU Delft, Netherlands

Self-monitoring is a critical process during self-regulated learning (SRL). The information gathered through self-monitoring can influence one's study decisions. For example, when learners judge themselves as not confident in having mastered a topic, they might revise it again. To make such self-judgments, learners have to rely on cues and feedback. However, providing feedback at an individual level can be challenging for teachers. Given the increasing use of technology in education, leveraging learning analytics to transform data into information as feedback appears to be a promising solution. Currently, the information presented in learning analytics dashboards, a tool meant to provide students with feedback, is commonly driven by data availability and often lacks theoretical grounding or connection to students' SRL needs. The current study explores learners' perspectives on what information they use and what information they are missing. Our two main research questions are 1) What are students' information needs when studying?, and 2) How can we use learning analytics to provide such information? Through eleven semi-guided interviews based on Zimmerman's SRL model, we gathered qualitative data on what information learners currently use and would like to have when studying. The outcome is a list of indicators (i.e., information that could be displayed on dashboards) categorized as task-, process-, and SRL-level feedback. Potential data sources (e.g., trace logs, self-report, sensors) are identified for each indicator. We discuss the implications of designing adaptive learning analytics dashboards as feedback for SRL and motivation.

Automated feedback on causal diagrams for self-regulated learning at the metacomprehension level
Presenting Author:Héctor J. Pijeira-Díaz, Maastricht University, Netherlands; **Co-Author:**Behrooz Nikandish, University of Groningen, Netherlands; **Co-Author:**Gosse Bouma, University of Groningen, Netherlands; **Co-Author:**Janneke van de Pol, Utrecht University, Netherlands; **Co-Author:**Anique de Bruin, Maastricht University, Netherlands

In learning from texts containing causal relations, completing causal diagrams after reading improves students' comprehension judgment (i.e., metacomprehension) accuracy to some extent. Metacomprehension drives self-regulated learning as it informs effort and strategy allocation. Therefore, it is crucial to maximize metacomprehension accuracy, which is typically poor. We believe that real-time automated feedback on students' diagrams (e.g., correct vs incorrect) can help them further fine-tune their metacomprehension. In this multidisciplinary study, we explore the reliability of automatic feedback in this context. We leverage the most recent developments and models in the field of natural language processing. The models are trained and tested with a dataset of 10,094 diagram answers corresponding to six topics and produced by 740 secondary school students. Our best model achieves an automated feedback accuracy of 97% and a Cohen's kappa of .93 for human-computer reliability, which clearly surpassed the .80 obtained for human interrater reliability. Further, we also explored the generalizability to new topics and still obtained accuracies above 95% and kappas above 0.88. These results support the use of automatic scoring to explore the effect of highly accurate, real-time feedback on further improving students' metacomprehension. Our automated feedback system can be embedded in adaptive learning environments and intelligent tutoring systems where the diagram context is applicable.

Boundary conditions for leveraging group-level feedback for regulation of collaborative learning
Presenting Author: Sebastian Strauß, Ruhr-University Bochum, Germany; **Co-Author:**Nikol Rummel, Ruhr University Bochum, Germany

During collaborative learning the members of a group need to monitor and regulate their interaction processes. This requires them to collect feedback about past interaction and subsequently use this feedback to adapt the collaboration if necessary. Group awareness tools are a form of technology-support that provides groups with feedback on their collaboration. However, the boundary conditions under which groups benefit from these tools have not yet been systematically investigated. In this theoretical contribution, we propose potential boundary conditions that may affect whether groups take up the information from a group awareness tool and translate them into regulation by tying together prior research on group awareness tools and two small-scale field experiments that we conducted. The boundary conditions we identified encompass properties of the learning environment and design of the group awareness tool, characteristics of the individual group members such as knowledge, perceptions and motivation of individual group members, as well processes that are crucial while transforming feed-up into regulatory actions (i.e., feed-forward). We locate these boundary conditions within a cyclical model of regulation which allows us to point to potential starting points for future research on the design of group awareness tools, on processes that are necessary to leverage group-level feedback, and on effective regulation of collaboration.

Modelling Metacognitive Awareness with Epistemic Emotions in Collaborative Learning
Presenting Author: Ahsen Çini, University of Oulu, Finland; **Co-Author:**Muhterem Dindar, Tampere University, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland

Collaborative learning (CL) involves not only meta-cognitive, but also socio-emotional processes that involves group members to combine their efforts and resources to regulate and control their learning. Research has shown that a wide spectrum of emotions is manifested by learners during CL. Currently, there is limited knowledge on the interplay between epistemic emotions and metacognitive processes in CL. Therefore, the current study investigates how a specific epistemic emotion, surprise, is related to metacognitive awareness in CL. With this aim, the study investigates surprise as a dynamical system to develop and understanding on their transient and dynamic features during CL. Small groups of three high school students (N=87) worked on a collaborative task. Data collection was conducted with multiple data channels: background information, situated measures of metacognitive awareness, 360-degree video, and audio. The situated measures of metacognitive awareness included judgement of confidence, perceived task difficulty and mental effort. Machine learning was applied on the video recordings to detect surprise from participants' facial expressions. Recurrence quantification analysis was applied on machine learning output to calculate various dynamicity indices of surprise. The relationship between self-reported metacognitive awareness and dynamicity of surprise was tested with multilevel modelling. The results revealed that various dynamicity features of surprise (i.e., recurrence, determinism, laminarity, and trapping time, and average diagonal line) during CL was related to self-reported judgement of confidence, perceived task difficulty and mental effort. The current findings provide us new insights regarding individuals who display surprise use better learning strategies and show better self-regulation during CL.

Session K 8

24 August 2023 17:00 - 18:30
AUTH_DC3
Symposium

Teaching the Global Goals: teacher education programmes as a conduit for achievement of Agenda 2030

Keywords: Educational Policy, Gender Issues, Qualitative Methods, Sustainable Development, Teacher Effectiveness, Teacher Professional Development, Well-being
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Ann-Kathrin Dittrich, Austria
Discussant: Denis Francesconi, University of Vienna, Austria

This symposium reports on the work of the international Teach4Reach project. The project investigates the roles of teachers and teacher educators in supporting the global agenda for sustainability as conceptualised in the Agenda 2030. As a collaborative research project between the University of Pretoria, South Africa, the University of Innsbruck and the University of Vienna, Austria, the project engages researchers from multiple countries in the Global South and the Global North to interrogate the dynamics of sustainability within teacher education. A phenomenological approach is adopted. Data is collected through interviews, focus groups and vignette research over a period of two years. A series of webinars is utilised as the platform for data collection. Each webinar focuses on the role of teacher education in fostering support for Sustainable Development Goals (SDGs), for example, 3, 4, 5 and 10, being Good health and wellbeing, Quality education, Gender equality and Reduced inequalities. The webinars provide safe spaces for the sharing of ideas by various stakeholders, including researchers, teacher educators, teachers and postgraduate researchers. The aim of the symposium is to present emergent findings on the ways in which the sustainable development goals could be infused in and realised through teacher education programmes. The symposium will present findings on Good health and wellbeing, Gender equality and Quality education. The symposium will conclude by sharing the implications of teacher shortages in the context of quality education.

The integration of SDG 3 in Teacher Education for a sustainable future
Presenting Author: Irma Eloff, University of Pretoria, South Africa

This study investigates how teacher educators engage with the notion of good health and wellbeing, as it pertains to Sustainable Development Goal 3 (SDG 3) in Agenda 2030. The study adopts the PERMA theoretical framework on wellbeing. The study reports on a subset of the Teach4Reach research project that explores the role of teacher educators in sustainability. Data was collected during a series of international webinars over a 15-month period (2021–2022). The current study focuses on a purposefully selected webinar on SDG 3 which included participants from Austria, South Africa, Italy, Zambia, Germany, India, Uganda, Botswana, Zimbabwe, Uganda and Swaziland. The study utilises a vignette methodology, supplemented by interpretive phenomenological analysis (IPA) of interview data. Findings indicate: i) challenges of measurement and definition in the field of wellbeing, ii) high levels of intention to integrate health education, wellbeing and social emotional learning in work with future teachers, but fairly limited curricular integration, and iii) that wellbeing is studied and considered within a constellation of related wellbeing concepts.

The integration of SDG 4 in Teacher Education for a sustainable future
Presenting Author: Ann-Kathrin Dittrich, University Innsbruck, Austria

The world is facing various social, political and economic challenges. The Sustainable Development Goals (SDGs) can be seen as a guide for dealing with and reacting to global developments and their new requirements. SDG 4 "Quality Education" is more than a goal, it is a key instrument for a global transformation process and the realisation of the Agenda 2030. Teacher educators are one specific group which can play a major role as advocates of sustainability awareness,

and the attainment thereof. Their knowledge and competences are crucial for fostering and implementing education for sustainable development. Teacher educators influence the perspectives, values and pedagogical practices of in- and pre-service teachers and can in this regard lead the transformation of curricula, thus enhancing the quality of education in classroom settings. Based on interview data from the international project “Teach4Reach”, the aim of the paper is to present and stimulate discussion on ways in which SDG 4 currently features and how its visibility and impact can be improved through teacher education programmes. Preliminary findings demonstrate the urgent need to increase the awareness of SDG 4 amongst teachers and teacher-educators. Data collected through one of the Teach4Reach webinars attended by different stakeholders included ideas on how curricula can be shaped, and pointed out implementation challenges. The findings will be shared as well as the implications for theory and practice for teacher education in the Global North and South.

Forms of essentialisation of gender and culture in SDG 5 and the critical role of teacher(educators)
Presenting Author: Evi Agostini, University of Vienna, Austria

Essentialist construals of gender are often critiqued by feminists for the theoretical, empirical, and political concerns they raise. At the same time, it has also become apparent that the rejection of essentialism problematically undercuts feminist politics, by denying that women have any shared characteristics which could motivate them to move together as a collectivity. Whereas arguments against gender essentialism are supported by evidence that gender expectations differ significantly across cultures, this in turn can lead to some form of cultural essentialism. With a postcolonial perspective, this paper raises the question of how the categories gender and culture come to the fore in phenomenological vignettes and in international focus group discussions about SDG 5. Included were different stakeholders of teacher education programmes in the Global North and the Global South during an online-webinar of the Teach4Reach project in November 2021. Which categories of gender and culture are produced or reproduced? Finally, the paper discusses possibilities of how gender equality can be improved via teacher education programmes. The study indicates a global need for deeper understandings of gender, culture and stereotypes in teacher education.

Policies to address teacher shortages to achieve SDG 4 targets in Austria and South Africa
Presenting Author: Vasileios Symeonidis, University of Education Freiburg, Germany

Sustainable Development Goal 4 (SDG 4) advocates inclusive and equitable quality education for all. It is estimated that 69 million teachers need to be recruited by 2030; in this context, teacher education needs to be supported to increase the supply of qualified teachers, particularly in developing countries. This abstract aims to explore endeavours by national governments to support SDG 4 by addressing the challenges of teacher supply and demand. Drawing on two instrumental case studies, one from the Global South (South Africa) and one from the Global North (Austria), it describes policy initiatives on teacher education, alternative pathways to teaching qualifications, and school autonomy. The study posits that countries’ responses tend to have a strong national focus, with limited consideration of global challenges in teacher education, and a singular focus on *teachers* to deal with the increasing challenges in education. The study indicates a need for increased international collaboration on teacher education and a comprehensive reconceptualisation of the teaching workforce.

Session K 9

24 August 2023 17:00 - 18:30
AUTH_DC1
Symposium
Higher Education, Instructional Design, Learning and Instructional Technology

Visualizing Learning Processes in Learning From Text and Multimedia: An Eye-Tracking Approach

Keywords: Classroom Assessment, Comprehension of Text and Graphics, Computer-assisted Learning, Eye Tracking, Higher Education, Misconceptions, Multimedia Learning, Primary Education, Reading, Video-based Learning
Interest group: SIG 27 - Online Measures of Learning Processes
Chairperson: Emmelien Merchie, Ghent University, Belgium
Organiser: Leen Catrysse, Belgium
Discussant: Tamara Van Gog, Utrecht University, Netherlands

Eye tracking has traditionally been used to investigate learning processes and individual differences in learning processes. However, there are increasing applications of the use of eye tracking to enhance rather than investigate learning processes. Therefore, the visual analysis of eye movement data during learning is becoming an emerging field providing important means to support learning processes. In this symposium, we showcase studies that have investigated innovative visualizations of learning processes using eye tracking, with the aim of enhancing learning. It includes studies that investigate innovative visualization of learning processes that allow to better understand individual differences in learning processes (Paper 1 and 2). It also includes studies that have applied such innovative visualizations to enhance learning (Paper 3 and 4). The first paper presents a social network approach to visualize reading processes while learning from expository text. The second paper presents a dynamic educational process mining approach to analyze visual behavior patterns when reading mind maps. The third paper uses eye-movement modeling examples (EMMEs) to foster attention to sources while reading multiple documents. The fourth papers also uses EMMEs in a live classroom setting to enhance students’ attention to relevant information. The symposium will be concluded by the discussant who will discuss this emerging field both from methodological and practical perspectives.

How eye Read: A Social Network Approach
Presenting Author: Leen Catrysse, Open Universiteit, Department of Online Learning and Instruction, Belgium; **Co-Author:**Tine van Daal, University of Antwerp, Belgium; **Co-Author:**Halszka Maria Jarodzka, Open Universiteit, Department of Online Learning and Instruction, Netherlands; **Co-Author:**Vincent Donche, University of Antwerp, Belgium; **Co-Author:**David Gijbels, University of Antwerp, Belgium

Learning from texts is one of the most essential skills in higher education. Therefore, considerable efforts have been made in educational research to better understand the reading process associated with learning from an expository text. In order to register the ongoing reading process, eye movement registration has been used to a large extent in reading research. Up to now, mostly duration measures such as first-pass and second-pass fixation durations are analyzed in reading research to gain more insight in this ongoing process. However, not only the duration in certain areas of interest (AOIs) can inform us on reading processes but also the transitions or relations between AOIs can indicate differences in integration processes while reading. Therefore, this paper offers a unique perspective on eye movement analysis in reading research by applying techniques from social network analysis. We visualized reading networks and analyzed centrality measures of reading networks from 31 students while reading three expository texts. Centrality measures are analyzed with (generalized) linear mixed-effects models. Results show that different patterns emerge and that this social network approach offers a promising way to analyze transitions or relations between AOIs in eye movement data.

How do Primary School Students Read Mind Maps? A Process Mining Analysis of Eye-Tracking Patterns
Presenting Author: Emmelien Merchie, Ghent University, Belgium; **Co-Author:**Sofie Heirweg, Ghent University, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium

This study investigated the eye-tracked visual behavior patterns of 44 late primary education students when reading mind maps. More particularly, the processing of visual characteristics, reading sequence and presentation mode (i.e., mind map before or after text) was studied. Static early attention and dynamic educational process mining (EPM) analysis were conducted. Further, also learning performance and interview data were gathered. During initial reading, all students seem to struggle with the map’s radial structure. Also, the picture’s position in the map seems to influence if and how students read interconnected branches. Furthermore, EPM analyses revealed different reading patterns in proceeding reading behavior. The radial structure is grasped slightly more by students receiving a text first. These students also show higher information integration attempts and attain higher free recall and coherence scores. The study reflects upon didactical guidelines for explicit visual literacy instruction in primary education.

Can Video Models Help Debunk the Learning Styles Misconception When Reading in L2?

Presenting Author: Ladislao Salmerón, University of Valencia, Spain; **Co-Author:**Juliana do Amaral, FEDERAL UNIVERSITY OF SANTA CATARINA, Brazil

Misconceptions are a type of prior belief that interfere with the construction of a situation model. In L2 reading, emerging research has pointed to a moderating effect of text language (L2) in text-belief consistency (Karimi, Richter, 2021). The present study aimed at investigating the effectiveness of eye-movement modeling examples (EMMEs) to help reduce the Learning Styles misconception, among L2 readers. EMMEs are recordings of the reader's eye movements while performing a learning task. They have been explored in their potential to inform metacognitive instruction (Xie et al., 2021). We assumed that EMMEs would foster readers' attention to source features, which in turn could facilitate the identification of reliable sources contrary to Learning styles and the adoption of a critical perspective. 58 undergraduate students speakers of English (L2) participated in the study. Participants answered a demographic questionnaire, the Learning Styles questionnaire and an English test. Then, they either watched the EMMEs or the control video. Next, they read web pages that either endorsed or refuted the Learning Styles misconception while their eye movements were recorded. Last, they wrote an essay about the topic, answered a source-memory task and again the Learning Styles questionnaire. Results indicated that EMMEs partially foster attention to sources when reading multiple documents in L2, but they do not help students to reduce their beliefs on the Learning styles misconception. Additional instructional efforts may be needed to apply sourcing strategies to critically evaluate information in L2.

Look Where I Look! Real-time Eye Movement Modeling Examples (EMME) in the Classroom
Presenting Author: Halszka Maria Jarodzka, Open Universiteit, Department of Online Learning and Instruction, Netherlands; **Co-Author:**Diederick Niehorster, Lund University, Sweden; **Co-Author:**William Rosengren, Lund University, Sweden; **Co-Author:**Marcus Nyström, x, Sweden; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

Classrooms are becoming increasingly digital. One novel digital technology, that might enter classrooms soon, is eye tracking. This is a method to measure someone's eye movements to infer where they looked. Thus far, eye tracking was already used to display where a teacher is looking when explaining teaching material as offline, pre-recorded videos. In this way, students were better able to follow the teacher's explanation and better learn from them (i.e., eye movement modeling examples). We present how this approach can also be implemented in real time, during teaching. We recorded the eye movements of a teacher, who was providing a lecture on eye tracking based on a PowerPoint presentation. We displayed his eye movements in real-time to 44 students who were present in the same classroom. We provided one of three different versions of the material to the students: either the PowerPoint only (n=14), the PowerPoint with an overlay of the teacher's eye movements as a circle (n=15) or as spotlight on the material (n=15). All students were sitting in a digital classroom equipped with an eye tracker per student to also record their eye movements. Results showed that the spotlight guided students' attention significantly more than the circle or no cue. However, students' learning outcomes were not affected significantly by the EMME. During the conference, we will describe the technical set-up, ideas for future research, as well as possible future applications in educational practice.

Session K 10

24 August 2023 17:00 - 18:30
UOM_A02
Single Paper
Motivational, Social and Affective Processes

Motivation to Read and Write

Keywords: Achievement, At-risk Students, Attitudes and Beliefs, Mindsets, Motivation, Reading, Secondary Education, Self-efficacy, Teaching Approaches, Writing/Literacy
Interest group: SIG 08 - Motivation and Emotion, SIG 12 - Writing
Chairperson: Choo Mui Cheong, The University of Hong Kong, Hong Kong

Relationships between motivational factors and reading comprehension in bilingual fourth-graders
Keywords: Achievement, Motivation, Reading, Self-efficacy
Presenting Author: Choo Mui Cheong, The University of Hong Kong, Hong Kong; **Co-Author:**Yaping Liu, The University of Hong Kong, Hong Kong; **Co-Author:**Rex Hung Wai Ng, The University of Hong Kong, Hong Kong; **Co-Author:**Shek Kam Tse, The University of Hong Kong, Hong Kong

While there are many studies that focused on the impact of motivation factors in L1 or L2 separately, less research attention has been paid to the effects of these factors on L1 and L2 simultaneously. This study aimed to 1) explore the relationship between reading self-efficacy, intrinsic motivation, extrinsic motivation, and reading comprehension in both L1 and L2; 2) identify whether self-efficacy, intrinsic motivation, extrinsic motivation, and reading comprehension performance can be transferred from L1 to L2; 3) investigate the potential transfer pathways between L1 self-efficacy and L2 reading comprehension. Structural equation modelling was conducted to analyze the data from 38 Hong Kong schools with 2,894 fourth-grade primary school students. Results found that, in both L1 and L2, self-efficacy had a positive relationship with reading comprehension, intrinsic motivation, and extrinsic motivation; and intrinsic motivation positively influenced reading comprehension, while extrinsic motivation is negatively associated with reading comprehension. For cross-linguistic transfer, intrinsic motivation, extrinsic motivation, and reading performance transferred directly from L1 to L2, while self-efficacy did not. Meanwhile, the effect of L1 self-efficacy on L2 reading comprehension was mediated by LI and L2 intrinsic motivation, LI and L2 extrinsic motivation, and L1 reading comprehension through multiple pathways. Theoretically, this study extends the language interdependence hypothesis by empirically showing the cross-linguistic transfer of motivational factors. Practically, this study provides informative evidence for teachers to tailor effective intervention targets to improve students' L2 reading comprehension.
Keywords: Self-efficacy, intrinsic motivation, extrinsic motivation, Chinese L1, English L2, cross-linguistic transfer

Group-based motivational profiles and their association with students' writing performance
Keywords: Attitudes and Beliefs, Mindsets, Motivation, Writing/Literacy
Presenting Author: Rui Alexandre Alves, University of Porto, Portugal; **Co-Author:**Ana Camacho, University of Porto, Portugal; **Co-Author:**Fien De Smedt, Ghent University, Belgium; **Co-Author:**Rui Maio, Faculty of Psychology and Educational Sciences of the University of Porto, Portugal; **Co-Author:**Joana Cadima, University of Porto, Portugal; **Co-Author:**Hilde Van Keer, Ghent University, Belgium

Previous empirical research has documented the positive link between motivation and students' writing performance. However, this body of research has mainly relied on a variable-centered research approach and there are still few studies based on a person-centered research approach. In the current study we addressed this methodological gap by examining the association between different students' motivational profiles and their writing performance. Specifically, we aimed to: (a) identify different motivational profiles in writing, based on students' implicit theories and achievement goals; (b) examine whether students in different profiles differed in their writing performance. We recruited 212 Portuguese sixth grade Portuguese students (M = 11.11 years, SD = 0.56), who filled in motivational self-report scales and performed writing tasks. Based on hierarchical and k-means cluster analyses, our results revealed a two-cluster profile solution. We identified one motivational profile characterized by a fixed mindset and more oriented towards performance-approach and performance-avoidance goals, and another motivational profile characterized by a growth mindset and less oriented towards performance-based goals. Of note, students in the growth mindset profile outperformed students in the fixed mindset profile in terms of text quality. In addition, teachers assigned significantly higher writing grades to students in the growth mindset compared with students in the fixed mindset profile. Overall, these findings underline the key role that motivational variables play in writing performance. Importantly, teachers need to foster a growth mindset and avoid the promotion of performance-based goals to enhance students' writing performance.

Writing Motivation and Ability Profiles and Transition after a Technology-Based Writing Intervention
Keywords: Motivation, Secondary Education, Self-efficacy, Writing/Literacy
Presenting Author: Tania Maria Cruz Cordero, University of Delaware, United States; **Co-Author:**Joshua Wilson, University of Delaware, United States; **Co-Author:**Corey Palermo, Measurement Incorporated, United States; **Co-Author:**Halley Eacker, Measurement Incorporated, United States; **Co-Author:**Matthew Myers, University of Delaware, United States; **Co-Author:**Andrew Potter, University of Delaware, United States; **Co-Author:**Jessica Coles, Measurement

Incorporated, United States

We identified writing motivation and ability profiles and transition paths of 2,487 U.S. middle-school students participating in an automated writing evaluation (AWE) intervention using MI Write. Four motivation profiles emerged from a latent transition analysis with self–reported writing self–efficacy, attitudes toward writing, and writing performance measures: Low, Mid/Low, Mid/High, and High. The majority of students started the school year in the Mid/Low (38%) and Mid/High (32%) profiles. Only 12% of students started the school year in the High profile. The most common transition path was to remain in the same profile in the Spring (61%). Larger transitions (e.g., from High to Low profile or vice versa) were only found on less than 1% of students. Assignment to intervention did not significantly influence transition paths. Students receiving special education or in the priority population were more likely to be in the Low and Mid/Low profiles than in the High profile in the Fall. These students were more likely to stay in the lower profiles in the Spring. Results provide a promising profiling strategy focused on students' attitudes and motivations and show students' most likely profile and transition paths based on their demographic characteristics. Finally, despite previous research indicating positive effects of AWE on writing motivation, results indicate that simply implementing AWE in schools with a majority of at-risk populations is insufficient to produce meaningful changes in students' writing motivation profiles or writing outcomes. Therefore, interventions targeting writing motivation, in conjunction with AWE, could improve results.

Exploring the relation between autonomy supportive teacher behavior and students' reading motivation
Keywords: At-risk Students, Motivation, Reading, Teaching Approaches
Presenting Author: Nele Bleukx, KU LEUVEN, Belgium; **Co-Author:**Katrijn Denies, KU LEUVEN, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium; **Co-Author:**Koen Aesaert, K.U.Leuven, Belgium

Research points to the importance of autonomous reading motivation (ARM) for better reading comprehension. According to the self-determination theory (SDT), autonomous motivation can be promoted through teachers' autonomy supportive behavior (ASB). Unfortunately, teachers tend to offer less autonomy to their lower performing students, even though they might benefit more. The present study investigates whether different student groups within reading education experience different degrees of ASB. In addition, the relationship between ASB and ARM and differential effects of students' background characteristics are further investigated within the field of reading education. In total, data from student questionnaires of 1623 fourth-grade students nested in 94 classes were used. Multilevel analysis indicates overall positive associations between ASB and ARM. Furthermore, boys and students with a low SES report less autonomy support from their teachers compared to their high SES female peers. Finally, results suggest ASB might be particularly beneficial for boys in relation to their ARM. Results of this study are in line with previous research, revealing a disturbing educational paradox in the field of reading instruction, i.e. students at risk for lower reading comprehension abilities and motivation, experience less autonomy support from their teacher. This trend is alarming, considering the universal positive influence of ASB, independent of the students' background characteristics.

Session K 11

24 August 2023 17:00 - 18:30
UOM_R09
Single Paper
Educational Policy and Systems

Educational Policy and School Reform

Keywords: Achievement, Conceptual Change, Early Childhood Education, Educational Policy, Ethics, Mixed-method Research, Primary Education, Qualitative Methods, School Effectiveness, School Leadership, Secondary Education, Sustainable Development
Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Yves Mühlematter, Switzerland

The role and function of district superintendents: A systematic literature review
Keywords: Educational Policy, Ethics, School Leadership, Sustainable Development
Presenting Author: Mona Holmqvist, Lund University, Sweden; **Co-Author:**Martin Lantz Ekström, Malmö University, Sweden

Abstract The superintendent role is not easy to identify, as the enactment differs based on contextual differences, as well as what societal expectations and policies they are expected to meet. However, a general assumption is that they shall assist the district education authority, or the local board to ensure the regulations that apply to education. Here rests many challenges. One is how superintendents position themselves within a politicised administrative system between principals and the district board, and the variety of possibilities to interpret and implement policy intentions. To contribute with knowledge about the role of the superintendent, this article synthesizes literature from research, with the goal of highlighting what has been published on the role and function of the district superintendent between the years 2000 and 2022. Systematic searches were conducted using the databases ERIC, ERC, Web of Science and Swepub. After review of exclusive and inclusive criteria, as well as a Quality check, 38 of the 315 peer-reviewed articles initially found, met the inclusion criteria. The main part of the articles (32) was reporting a US context. Six main themes emerged in the analysis: (1) contextualisation of the superintendent, (2) gender, (3) ethics, (4) policy implementation, (5) superintendent knowledge, and (6) decision making. The results of the studies' are synthesized within each category.

School reform for the future? Change processes during the establishment of all-day schools
Keywords: Conceptual Change, Educational Policy, Mixed-method Research, Primary Education
Presenting Author: Michelle Jutzi, University of Teacher Education Bern, Switzerland; **Co-Author:**Barbara Stampfli, PHBern – University of Teacher Education, Switzerland; **Co-Author:**Regula Windlinger, Institut für Forschung, Entwicklung und Evaluation, PHBern, Switzerland; **Co-Author:**Ulrich Hostettler, University of Teacher Edaucation Bern (PHBern), Switzerland

This evaluation study examined the opening and development of three schools over two years and identified opportunities and challenges in the introduction, implementation, and integration processes. These new schools aim to provide a holistic education as well as cross-grade and individualized learning for children. In addition, they serve families with high childcare needs on lunchtime and afternoons and offer of a "home away from home". The current state of research shows that there are only a few studies that deal with the level of the individual school development and describe which changes become noticeable for students, staff and parents in everyday life in the process of opening a new school. The three schools studied are labelled as “all-day schools” which means that they combine instruction and care. We conclude that the structural reorganization of the interplay between teaching and care entails far-reaching consequences, concerning the organization of teaching, questions of professionality and forms of collaboration. In this regard, the data shows noticeable differences in the relationships between teachers, caregivers and children. Furthermore, this study reveals that the reform is comprehensive, i.e., it affects pedagogical and organizational concepts, the school's strategy with regard to the public and pedagogical practice.

A Controversially Received Reform: The 2018 Renewal of Finnish Higher Education Student Admission
Keywords: Achievement, Educational Policy, School Effectiveness, Secondary Education
Presenting Author: Risto Hotulainen, University of Helsinki, Finland; **Co-Author:**Sirkku Kupiainen, University of Helsinki, Finland; **Co-Author:**Irene Rämä, University of Helsinki, Finland

The Finnish matriculation examination is the only high stakes test in the Finnish education system. The examination marks the end of academic track upper secondary education and eligibility for tertiary education. Until 2018, practically all students entered higher education through a program-specific entrance examination, a procedure largely responsible for Finnish students' slow transit from secondary to tertiary education. To remedy the situation and accelerate the transit, a reform in 2018 decreed that half of new students in all higher education programs are to be chosen based on their matriculation examination results. While the matriculation examination has a long history and it is widely accepted, the reform has been strongly contested. The main source of controversy is the way the credit is awarded for the different subject-specific exams. As the credit is based on the number of courses covered by the exam, advanced mathematics provides most credit even in fields where proficiency in it might appear of less value.

In the present study, we explore the reception of the reform in upper secondary schools (surveys for students, teachers, principals, and guidance counsellors) focusing on the impact of the reform on students' wellbeing and study and examination plans (register data). The large-scale study (N=8000) is implemented in 2022–2023, with full results available in June 2023. Due to the strong opposition, the reform will be opened up for renewal in 2024. The present study aims at providing evidence of the impact of the reform for this process.

Opportunities & Challenges of Two Policy Measures to Reduce Educational Inequalities in Switzerland
Keywords: Early Childhood Education, Educational Policy, Qualitative Methods, Secondary Education
Presenting Author: Anja Winkler, University of Teacher Education Bern, Switzerland; **Presenting Author:**Angela Rebecca Aegerter, University of Bern, Switzerland; **Co-Author:**Andrea Erzinger, University of Bern, Switzerland

In modern knowledge-based societies, education is considered a central resource. Today in Switzerland, an upper secondary level education is considered a basic requirement for successful, independent participation in adult and working life (Meyer, 2009). Those who do not hold this minimum level of educational certification can be affected by educational poverty (Quenzel & Hurrelmann, 2019). In our research project XX we examine measures to reduce educational inequality and their implementation in the political system. In this paper, we discuss two selected measures to reduce educational inequalities in Switzerland: (1) A case study of an early intervention program for children (ages 0-3) and their families with multiple stresses and (2) a school model of a public school at the lower secondary level, which particularly promotes individual learning processes in mixed-ability classes. To examine the measures, three interviews, one focus group discussion, and one guided tour were conducted for each measure. The results of the case studies point to numerous positive facets and impacts on educational inequalities while being difficult to implement and establish through complex (educational) policies. Based on the examples examined, approaches to reducing educational inequalities are derived.

Session K 12

24 August 2023 17:00 - 18:30
UOM_A13
Single Paper
Learning and Instructional Technology

Technology-Enhanced Instructional Design

Keywords: Computer-assisted Learning, E-learning/ Online Learning, Educational Technologies, Immersive Technologies for Learning, Instructional Design, Learning Strategies, Metacognition, Multimedia Learning, Self-regulated Learning and Behaviour, Teaching/Instructional Strategies
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Karin Street, Norway

Active Integration of Representations in Augmented Reality
Keywords: Educational Technologies, Immersive Technologies for Learning, Instructional Design, Multimedia Learning
Presenting Author: Jule Krüger, University of Potsdam, Germany; **Co-Author:**Franziska Schacht, University of Duisburg-Essen, Germany; **Co-Author:**Daniel Bodemer, University of Duisburg-Essen, Germany

In augmented reality (AR), interaction can take many forms, including a combined interaction with virtual and physical elements. This includes more complex forms of interaction that can lead to higher cognitive demands but also deeper learning when designed purposefully. Cognitive Load Theory proposes the reduction of extraneous cognitive load (ECL) to free resources for deeper learning, but this does not necessarily lead to desired cognitive processes. The active integration method proposes external integration of representations to elicit mental integration processes. This has been found to improve learning outcomes compared to showing pre-integrated representations in studies with classic multimedia materials. The current study aims to examine the transferability of the results on active integration in more classic multimedia learning settings to the specific case of AR. We hypothesize a higher GCL, ECL and learning outcome for active integration in comparison to pre-integrated material. $N = 94$ participants took part in a study with learning material on combined cycle power plants, including text cards with process descriptions and animated, 3D virtual models of power plant components that either had to be actively integrated or were already pre-integrated. No significant differences were found in ECL, GCL and knowledge test, rejecting all three hypotheses. Exploratory analyses of screen-recordings during the learning phase showed a less stable view and less visibility of virtual objects during active integration, which may have cancelled out potentially positive effects of the activity. Results are being discussed in view of the uniqueness of AR and potential implications of the results.

Learning by Explaining in School: Testing the Generalizability within a ManyClasses Study
Keywords: Computer-assisted Learning, Instructional Design, Learning Strategies, Teaching/Instructional Strategies
Presenting Author: Leonie Sibley, University of Tübingen, Germany; **Co-Author:**Heike Russ, University of Tübingen, Germany; **Co-Author:**Andreas Lachner, University of Tübingen, Germany

Prior research has shown that generating explanations for a fictional peer can be conducive to learning and seems to be more beneficial than retrieving previously learned contents. This explaining effect has been almost exclusively investigated in laboratory contexts. It is therefore still unclear whether the results can be replicated in classrooms that provide real but different learning environments. Additionally, it is not clear under which conditions explaining is effective since prior research has just started to explore potential boundary conditions of learning by explaining. Therefore, within this study, the explaining effect and its boundary conditions were tested in a *ManyClasses field study*. The approach aims at testing an effect in diverse settings to test its generalizability and to explore boundary conditions. So far, six classes participated in the study ($N = 118$ school students). We aimed at collecting data of 140 students in total until March 2023 to guarantee a power of 80%. In each class, the teacher held two teaching units about comparable but different topics. Using a within-subjects posttest design, students either explained the previously learned contents to a fictitious peer by creating a video or retrieved the contents after the teaching unit. Preliminary results showed no main effect of explaining compared to retrieving regarding students' learning. Interestingly, discipline moderated the explaining effect as students only benefitted from explaining in non-STEM-related subjects. None of the remaining moderators were significant, although grade-related rewards approached significance. This study therefore adds to prior research as crucial boundary conditions were investigated.

Do distributed practice reminders promote children's learning with a digital learning app?
Keywords: Computer-assisted Learning, E-learning/ Online Learning, Learning Strategies, Self-regulated Learning and Behaviour
Presenting Author: Lea Nobbe, DIPF Frankfurt, Germany; **Co-Author:**Jasmin Breitwieser, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Daniel Biedermann, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Garvin Brod, DIPF | Leibniz Institute for Research and Information in Education, Germany

Studying without supervision can be challenging for children and is especially prevalent when studying in digital learning environments. Within this 37 day intensive longitudinal study, 84 children used two apps simultaneously: One app to study their vocabulary, the other to answer questions and receive interventions which were designed to help them study more regularly. While both the control and experimental group started out by watching a video on the benefits of a distributed practice strategy, only the experimental group received reminders of the strategy, which were presented on half of the study days. While the distributed practice reminders did increase the probability to study in the experimental group, overall the experimental group did not study more frequently than the control group. When only looking at the days without distributed practice reminders, they had a lower probability of studying than the control group, which suggests a detrimental side effect of the distributed practice reminders. These results warrant caution when using distributed practice reminders as a tool to get children to study more regularly. One possible mechanism leading to the detrimental side effect of distributed practice reminders could be an overreliance on them.

Implementing metacognitive prompts in segmented dynamic visualizations - Beneficial for learning?

Keywords: Educational Technologies, Instructional Design, Metacognition, Multimedia Learning
Presenting Author: Felix Krieglstein, Chemnitz University of Technology, Germany

Dynamic visualizations such as whiteboard animations can quickly exceed learners' working memory because of their transient nature. To counteract this, the segmentation principle can be used to separate the learning material into smaller, "digestible" segments. By this, the learner has more time to process the learning contents. However, it is relatively unclear whether an increase in segmentation (resulting in more pauses between the segments) leads to better learning performance. Furthermore, the idea of this work to use the pause between two segments for metacognitive activities in which learners reflect on their current learning progress. Across two experiments involving different whiteboard animations and corresponding learning topics (N_1 = 132; N_2 = 119), the number of segments was manipulated by dividing the whiteboard animations into one (i.e. no segmentation), two, three, or four segments. Moreover, the use and number of metacognitive prompts (i.e., on-screen instructions to recap already learned information) were examined by including these prompts in either pauses between the segments or after the animation. The results showed that an increase in segments did not lead to better learning performance or reduced intrinsic cognitive load perceptions. Metacognitive prompts did not result in more accurate judgment of learning evaluations. Results should encourage researchers to develop interventions designed to promote metacognitive activities while learning with dynamic media.

Session K 13

24 August 2023 17:00 - 18:30
UOM_R08
Single Paper
Assessment and Evaluation, Teaching and Teacher Education

Teachers' Professional Development: The Role of Reflective Practices

Keywords: Assessment Methods, Attitudes and Beliefs, Competencies, Dialogic Pedagogy, In-service Teachers, Knowledge Construction, Metacognition, Primary Education, School Effectiveness, Self-regulated Learning and Behaviour, Teacher Professional Development, Well-being
Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Roman Švaříček, Masaryk University, Czech Republic

Role of impasse in teacher learning
Keywords: Attitudes and Beliefs, Dialogic Pedagogy, In-service Teachers, Teacher Professional Development
Presenting Author: Roman Švaříček, Masaryk University, Czech Republic; **Co-Author:**Klara Sedova, Masaryk University, Czech Republic; **Co-Author:**Zuzana Salamounova, Masaryk University, Czech Republic; **Co-Author:**Martin Sedlacek, Masaryk University, Czech Republic

The aim of this paper is to identify the role of impasse in changing a teacher's thinking and behaviour during a teacher development programme. We conducted an intervention aimed at fostering collectivity in classroom dialogue in which all the students in the class were to contribute to as similar an extent as possible. The requirement to work with all students caused an impasse because it drew attention to the subjective teacher judgment of the students' lack of ability and to the objective low level of participation of silent students who engaged exclusively in response to the teacher's questions.During the 2021/2022 school year, six classes (123 students) and their six teachers participated in the intervention. The intervention involved workshops for teachers, a series of video recordings of their lessons, and interviews with each teacher stimulated by the video recordings. This paper asks the following research questions: (1) How is the process of change in a teacher's thinking and teaching enabled in the development programme? (2) What role does impasse play in the teacher's learning process? The analysis showed that impasse plays a key role in the teacher learning process, destabilizing the cognitive-affective block that enables teachers to reach and remain in a balanced state. We analyse in detail the situations that lead to teacher beliefs and judgements being challenged and further focus on describing how teachers resolve these impasses with the help of cognitive activity. The role of a researcher in scaffolding teacher's cognitive activity is also discussed.

I reflect today, this week, or never? An experience sampling study of teacher activities
Keywords: Primary Education, School Effectiveness, Teacher Professional Development, Well-being
Presenting Author: Miriam Compagnoni, University of Zurich, Switzerland; **Co-Author:**Beat Rechsteiner, University of Zurich, Institute of Education, Switzerland; **Co-Author:**Flurin Gotsch, University of Zurich, Institute of Education, Switzerland; **Co-Author:**Katharina Maag Merki, University of Zurich, Switzerland; **Co-Author:**Andrea Wullschleger, University of Applied Sciences and Arts Northwestern Switzerland PH (FHNW), Switzerland

To enable high-quality school development, teachers must reflect on their own competencies and pedagogical work in the classroom, within their team, and at school. However, a deeper understanding of how daily reflection activities interact with stress, satisfaction, and perceived benefits for student learning, is missing. Given the lack of reliable quantitative data on current practices in everyday school life, we assessed 801 Swiss teachers as part of a 21-day experience sampling study (ESM). Using an explorative approach, we first examined the number and type of pedagogical reflection activities that teachers undertook in everyday school life. Then, we constructed several multilevel models to assess the relationship between reflection activities and teachers' daily experience of stress, satisfaction and perceived benefits at the between- and within-person level. The exploratory results demonstrated that, on nearly half of the days, teachers reported activities that involved pedagogical reflection and development; however, pedagogical reflection and development at the team or school level were rare. As expected, the multilevel models revealed that, on days with reflection activities, teachers reported greater stress but also more benefits for students, their teaching, and their team. The between-person effects demonstrated that, on average, teachers who engaged in more reflection did not report higher stress but more benefits and higher satisfaction overall. These contribution highlights the importance of ESM data for teachers' everyday work lives and fosters an understanding on how professional learning communities can become a force for positive change.

"I know I don't know" - Does metacognitive accuracy moderate the validity of TPK self-assessments?
Keywords: Competencies, Metacognition, Self-regulated Learning and Behaviour, Teacher Professional Development
Presenting Author: Ulrike Franke, University of Tübingen, Germany; **Co-Author:**Iris Backfisch, University of Tuebingen, Germany; **Co-Author:**Armin Fabian, University of Tuebingen, Germany; **Co-Author:**Patrizia Breil, Ruhr-University of Bochum, Germany; **Co-Author:**Katharina Scheiter, University of Potsdam, Germany; **Co-Author:**Andreas Lachner, University of Tübingen, Germany

Valid test instruments of technological-pedagogical knowledge (TPK) are important means to provide adequate support in the course of teacher education. However, to date, mostly distal indicators have been used to measure TPK via self-assessments, which have often been criticized for their poor validity. Nevertheless, still to date, it is an open question whether TPK self-assessments correspond to performance-based TPK tests. In addition, metacognitive research postulated that the correspondence between TPK self- assessments and performance-based TPK tests may depend on teachers' metacognitive accuracy. To investigate the correspondence between TPK self-assessments and performance-based TPK tests, we conducted two cross-sectional studies with pre-service teachers (Study 1) and in-service teachers (Study 2). The participants in both studies assessed their TPK and answered a performance-based TPK test with open-ended text-based vignettes. Before answering the TPK test, participants rated their potential performance on the TPK test. We used difference scores to model participants' metacognitive accuracy. Across both studies, we only found a weak positive relation between TPK self-assessments and the performance-based TPK test. This effect was moderated by monitoring accuracy, as the correspondence between self-assessed TPK and TPK test score was higher, when participants demonstrated higher metacognitive accuracy. This finding indicates that the acquisition of TPK via self-assessments is determined by the metacognitive accuracy of the estimation of one's own knowledge. In addition, the findings suggest that self-assessments may not optimally capture teachers' TPK regardless of their working experience. Thus, the findings provide important indications with regard to the use of different measurements of TPK.

Generative resistance as knowledge work: Teacher's Engagement with Assessment Criteria
Keywords: Assessment Methods, In-service Teachers, Knowledge Construction, Teacher Professional Development
Presenting Author: Eli Tronsmo, University of Oslo, Norway; **Presenting Author:**Hege Hermansen, Oslo Metropolitan University, Norway

The global turn to outcomes-based curricula has positioned assessment criteria as an integral part of teachers' work. However, existing research shows that teachers' work with assessment criteria is often characterized by dilemmas and contradictions (Brown and Harris 2016), because assessment practices typically involve multiple purposes and a range of epistemic and social concerns. This conceptual paper addresses how teachers navigate such dilemmas by viewing teachers' engagement with assessment criteria as a form of knowledge work, understood as work that goes beyond routine in ways that require analytic effort, innovation, questioning and explorative activities (Newell et al. 2009). Employing sociomaterial approaches (Fenwick and Nerland 2014) and the concept of "generative resistance" (Carlsen, Clegg and Gjersvik, 2012), we substantiate our conceptual argument by drawing upon three different data sets on teachers' collaborative work from 2014, 2018 and 2021. We demonstrate three different dynamics of generative resistance. The first dynamic relates to *working with doubts and dilemmas* (such as securing productive relations between the different logics informing assessment practices). The second dynamic relates to *seeking out connections* (e.g. exploring connections between the local and the universal, between practice and research). The third dynamic relates to *dwelling in and re-configuring knowledge* (e.g. developing and testing ideas, framing and defining space for action). The findings offer new insights into in-service teachers' professional development in the context of everyday work. We also contribute to advancing existing conceptualisations of teachers' knowledge work, by unpacking the dynamics that supports teachers' agentic and transformative engagement with professional knowledge.

Session K 14

24 August 2023 17:00 - 18:30
UOM_CR
Single Paper
Higher Education, Teaching and Teacher Education

Teachers' Digital Competence and Challenges

Keywords: Attitudes and Beliefs, Digital Literacy and Learning, E-learning/ Online Learning, Educational Technologies, Higher Education, Lifelong Learning, Mixed-method Research, Teacher Professional Development, Teaching Approaches
Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education
Chairperson: Mika Igarashi, Japan

Teacher Educators' positioning and task perception concerning the facilitation of digital competence
Keywords: Attitudes and Beliefs, Digital Literacy and Learning, Higher Education, Teacher Professional Development
Presenting Author: Ilka Nagel, Østfold University College / University of Oslo, Norway

Teacher educators have many tasks and roles but the most prominent one is being a teacher of teachers. The role of teacher educators can be seen as vague and undefined which allows for several interpretations and understandings. This qualitative study provides more insight in teacher educators' positioning and task perception concerning the facilitation student teachers' professional digital competence. Eighteen in-depth interviews with teacher educators from six teacher education institutions in Norway are analyzed in two steps. First, teacher educator profiles are identified through an abductive approach going back and forth between the data and results from previous research. Second, the profiles' task perceptions concerning the facilitation student teachers' professional digital competence are analysed. Preliminary findings reveal three main profiles and related task perceptions: (1) pedagogues with a learner-centered perspective on teaching see it as their task to let students critically explore and experiment with digital tools for teaching and learning; (2) subject teachers who follow an instructor-centered approach focus on the function of digital tools for administration and instruction; and (3) reflective teachers of teachers who position themselves in the middle and combine both approaches see it as their task to develop their students' digital competence through being a role model and critically discussing the students' digital learning experiences. However, many teacher educators are not sure what their task concerning the facilitation of student teachers' professional digital competence is. The results may be used as a starting point in professional development approaches to discuss one's teaching practice and task perception.

Higher education teachers' profiles based on digital learning activities during online teaching
Keywords: Digital Literacy and Learning, E-learning/ Online Learning, Higher Education, Teaching Approaches
Presenting Author: Anne Lohr, Ludwig-Maximlians-University Munich, Germany; **Co-Author:**Michael Sailer, LMU Munich, Germany; **Co-Author:**Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

The first aim of this study was to investigate to what extent three profiles of higher education teachers based on their initiated digital learning activities during face-to-face teaching (Lohr et al., 2021) can be replicated in the context of online teaching during the COVID-19 pandemic. We differentiated digital learning activities into four types based on the ICAP-framework (Chi & Wylie, 2014): passive, active, constructive and interactive. The second aim of this study was to investigate to what extent higher education teachers in the different profiles differ regarding their technological knowledge, technological-pedagogical knowledge and technology-related attitudes. Based on a sample of 1173 German higher education teachers we replicated two profiles from the context of face-to-face teaching: *Powerpointers*, who mainly initiated passive digital learning activities and *Clickerers,* who mainly initiated passive and active digital learning activities. However, we found that in online teaching during the COVID-19 pandemic there is a differentiation of the profile of *Digital Pros*, who initiate all digital learning activities with a similar frequency, into *Orchestrators,* who initiated all types of digital learning activities to a high degree, and *Interactivators,* who especially initiated interactive digital learning activities. Higher education teachers in the four profiles did not differ regarding technological knowledge, however, Powerpointers and Clickers each had significantly lower technological-pedagogical knowledge than Orchestrators and Interactivators. Furthermore, Powerpointers showed more critical technology-related attitudes than all other profiles, while Orchestrators showed more positive attitudes. Results highlight the importance of higher education teachers' technological-pedagogical knowledge for students' cognitive activation during online teaching.

Teacher Educators' Challenges in the Context of Digital Transformation: A Mixed Methods Study
Keywords: Digital Literacy and Learning, Lifelong Learning, Mixed-method Research, Teacher Professional Development
Presenting Author: Marlene Wagner, University for Continuing Education Krems (Danube University Krems), Austria; **Co-Author:**Tobias Ley, Danube University Krems, Austria; **Co-Author:**Lydia Kammerer, Johannes Kepler University Linz, Austria; **Co-Author:**Christoph Helm, Johannes Kepler University Linz, Austria

The ongoing digital transformation requires teachers as well as teacher educators to re-conceptualise their roles and tasks. The purpose of the present study is to examine teacher educators' challenges in the context of digital transformation, their self-reported technological pedagogical content knowledge (TPACK) and the role of personal and contextual characteristics as predictors of teacher educators' TPACK using an exploratory sequential mixed-methods research design. Data were collected from individual semi-structured interviews ($N = 8$) and an online questionnaire ($N = 179$). Findings reveal that teacher educators experience challenges in the context of digital transformation both on the lecturer and the institutional level. However, they rate their technological knowledge, their technological pedagogical knowledge and their TPACK high. The results of structural equation modelling analysis indicate that teacher educators' frequency of digital technology use and their perceived challenges on the lecturer level are significant predictors of teacher educators' TPACK. Besides, participation in informal continuing professional development (CPD) and perceived challenges on the institutional level seem to have an impact on teacher educators' TPACK. Findings of the study shed light on teacher educators' digital upskilling needs and relevant personal and contextual factors which need to be considered in the design of professional development curricula.

Still an instrumental endeavor? Developing professional digital competence in teacher education
Keywords: Digital Literacy and Learning, Educational Technologies, Higher Education, Teacher Professional Development
Presenting Author: Synnøve H. Amdam, Volda University College, Norway; **Presenting Author:**Toril Aagaard, University of Southeast Norway, Norway; **Presenting Author:**Ilka Nagel, Østfold University College / University of Oslo, Norway; **Co-Author:**Karl Vika, NIFU, Norway; **Co-Author:**Fredrik Mørk Røkenes, Norwegian University of Science and Technology, Norway

Teacher educations (TE) across the globe face the task of preparing student teachers for a profession that is increasingly shaped by digitalization. Algorithms,

artificial intelligence, simulation software and virtual worlds are among the technologies with power to influence how people acquire knowledge and with what resources. Therefore, student teachers must learn to identify and take advantage of digital technologies, but also relate to the series of challenges which are of ethical, social, or societal character and have epistemic impacts. A main critique from scholars, however, has been the instrumental focus TE has had on teaching students how to use various digital resources for different educational purposes. In this paper, we present how teacher educators from five Norwegian TE institutions approach professional digital competence (PDC) in their teaching. We analyze the results from a survey conducted in 2021 (N = 389), to investigate if developing PDC in TE still is an instrumental endeavor, or if epistemic issues are paid more attention. We find that the teacher educators still have an instrumental focus, even if all the five institutions over the past four years have tried to develop PDC in TE through major R&D projects. Consequently, we discuss how further PDC development in TE can address instrumental and epistemic issues concurrently to ensure that future teachers are qualified to develop epistemic practices in agentic, transformative ways to the better for student teachers and finally pupils' learning.

Session K 15

24 August 2023 17:00 - 18:30
AUTH_T102
Single Paper
Teaching and Teacher Education

Multicultural Education: Teachers' Attitudes, Beliefs and Values

Keywords: Bullying, Cultural Diversity in School, In-service Teachers, Inquiry Learning, Instructional Design, Mixed-method Research, Multicultural Education, Pre-service Teachers, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Gonny Schellings, Eindhoven University of Technology, Netherlands

What predicts teachers' likeliness to intervene in situations of ethnicity-based exclusion?
Keywords: Bullying, Cultural Diversity in School, In-service Teachers, Multicultural Education
Presenting Author: Daria Khanolainen, University of Jyväskylä, Finland; **Co-Author:**Elena Semenova, Independent researcher, Unknown; **Co-Author:**Elvira Fatkhulova, Independent researcher, Unknown; **Co-Author:**Yulia Nesterova, University of Glasgow, United Kingdom

This study aims to examine what predicts teachers' likeliness to intervene in situations when students get excluded from peer activities because of their ethnicity and/or culture. As part of this study, 454 teachers currently employed in Russia completed an anonymous online survey. Teachers' likeliness to intervene was measured with two questions (1. How necessary is a teacher's involvement in such situations? 2. Relative to your other teaching demands, how important is it for you to address this situation?). These questions were presented after the teachers viewed a visual vignette showing a situation of student ethnicity/culture-based exclusion. The survey also included items tapping into beliefs about multiculturalism in general, beliefs about multicultural education specifically, empathic anger arising in stations of race/ethnicity-based mistreatment, and professional burnout. Various demographic data was also collected. To analyse the data, we constructed multiple linear regressions with latent variables using MPlus 7.0. Our preliminary analysis suggested that different types of teachers' multicultural beliefs were significantly predictive of their likeliness to intervene in situations of ethnicity/culture-based exclusion. Moreover, teachers with higher levels of professional burn-out were less likely to intervene, while teachers with higher levels of empathic anger were more likely to step in. At the same time, teachers' qualification level, professional experience, own minority status, and school's socio-economic status were not predictive. Implications for teacher education will be discussed at the conference.

Norwegian preservice teachers' competence to teach in multicultural and multilingual classrooms.
Keywords: Cultural Diversity in School, Mixed-method Research, Multicultural Education, Pre-service Teachers
Presenting Author: Wenche Elisabeth Thomassen, University of Stavanger, Norway

In this paper I will present findings from my PhD study about preservice teachers' competence to teach in multilingual and multicultural classrooms (Thomassen, 2021). This is a mixed- methods study and consists of three different data sets: group interviews with pre-service teachers in their 2d year of teacher training, data from a national survey with both preservice teachers, teacher educators at campus and mentor teachers in schools – as well as personal interviews with preservice teachers in their last year of teacher education. The main theoretical approaches are Critical Multiculturalism (Sleeter and May,2010) and Lucas and Villegas framework "Linguistically Responsive Pedagogy (2013). Critical Multiculturalism points to the importance of critical reflection of power relations is society and schools with an aim of creating change. The framework made by Lucas and Villegas outline important orientations, skills and knowledge teachers need for teaching second language learners in mainstream classrooms. In my presentation, I will discuss my findings related to the theoretical approaches, implication for Initial Teacher education and with an overriding goal to discuss what competence preservice teachers need to develop to be able to improve teaching and create change and hope for emergent multilingual learners in multicultural and multilingual classrooms.

Multicultural education, values and curriculum-content learning: a teacher training approach
Keywords: Inquiry Learning, Instructional Design, Multicultural Education, Teacher Professional Development
Presenting Author:ELENI PAPAGEORGIOU, Cyprus Pedagogical Institute, Cyprus; **Co-Author:**Pavlina Hadjitheodoulou-Loizidou, Cyprus Pedagogical Institute, Cyprus

Abstract The study proposes a teachers' training course, for embedding the development of values in curriculum-content instruction in multicultural classrooms. The course focuses on revealing challenges related to teaching in multicultural settings and the use of real-life social contexts as thematic frameworks for teaching the content of the school curriculum. A pre-post design process for evaluating the effectiveness of the twelve-hour training course was implemented, alongside with a qualitative approach, including teacher interviews and teaching observations. Positive effects on teachers' self-efficacy, beliefs and practices in teaching were identified after completing the course. Further professional learning opportunities for teaching that involves both the development of fundamental values and teaching of the content of curriculum subjects were also stressed.

Session K 16

24 August 2023 17:00 - 18:30
UOM_A11
Single Paper
Assessment and Evaluation, Learning and Instructional Technology, Learning and Special Education, Teaching and Teacher Education

Assessment in Mathematics: New Methods

Keywords: Classroom Assessment, Cognitive Skills and Processes, Competencies, Computer-assisted Learning, Eye Tracking, Feedback, Inclusive Education, Mathematics/Numeracy, Primary Education, Quantitative Methods, Secondary Education
Interest group: SIG 01 - Assessment and Evaluation, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education, SIG 15 - Special Educational Needs
Chairperson: Claudia Reiter, Germany

Development and Validation of a Multiplicative Operation Sense Assessment Instrument in 5th Grade
Keywords: Classroom Assessment, Competencies, Mathematics/Numeracy, Quantitative Methods
Presenting Author: Eva Schultheis, University of Education Freiburg, Germany; **Co-Author:**Katharina Loibl, University of Education Freiburg, Germany; **Co-Author:**Timo Leuders, University of Education Freiburg, Germany; **Co-Author:**Frank Reinhold, University of Education Freiburg, Germany

Abstract
Studies show that a considerable number of students start secondary school with fundamental gaps in basic mathematical skills. Especially when multiplying and dividing, many students lack a sufficient understanding of operations, which is crucial for further mathematics learning. The conceptual understanding of operations—operation sense—is the ability to relate situations (e.g., word problems) to mathematical-symbolic notations (e.g., calculations, equations) and vice versa. To allow for adaptive support for operation sense, the understanding or the lack thereof needs to be assessed systematically. However, a sensitive assessment instrument specifically tailored to the operations of multiplication and division - which can be used for a focused diagnosis and for evaluation of specific interventions in this domain - is so far missing. Based on an existing more general assessment ("Lernstand 5", Schulz et al. 2019) we developed an instrument for assessing *multiplicative* operation sense, which represents theoretically founded levels of understanding operations in multiplicative situations. In the validation study (N=66) general linear mixed models revealed that 86 % of the variance in item difficulty can be explained by the four theoretically founded levels of multiplicative operation sense. Thus, it can be assumed that this test is a valid test instrument, which can be recommended as a basis for subsequent adaptive support and formative assessment.

How PCK sharpens teachers' views when judging mathematical tasks: An eye-tracking study
Keywords: Cognitive Skills and Processes, Eye Tracking, Mathematics/Numeracy, Secondary Education
Presenting Author: Kirsten Brunner, Pädagogische Hochschule Freiburg, Germany; **Co-Author:**Andreas Obersteiner, Technical University of Munich, Germany; **Co-Author:**Timo Leuders, University of Education Freiburg, Germany

Teachers' ability to accurately judge difficulties of mathematical tasks is an essential facet of their diagnostic competencies. Although research has suggested that pedagogical content knowledge (PCK) is positively correlated with the accuracy of diagnostic judgments, experimental studies that address causal effects are largely lacking. Specifically, it has not been investigated how PCK affects the processes of perception and interpretation of relevant task characteristics.In this intervention study with a control group, 49 prospective mathematics teachers judged the difficulty of 20 tasks involving functions and graphs while having their eye movements tracked by an eye tracker. Some of the tasks included characteristics that are well known to be difficult for students. Participants' domain-specific PCK was manipulated through a two-hour intervention, during which they learned about the most common student errors in function and graph problems. We hypothesized that such knowledge would be required to make accurate reasoning about task difficulty, and would affect participants' eye movements. Pre–post comparisons revealed a large effect of the intervention on participants' domain-specific PCK. At posttest, participants in the intervention group provided more accurate reasoning about task difficulty than participants in the control group. Furthermore, they showed more focused eye movements on task characteristics relevant to difficulty. Thus, the PCK intervention led to more efficient processing of relevant task characteristics, and to more accurate reasoning about task difficulty.

On the Perception and Effectiveness of the Feedback Quality from a Digital Learning Platform
Keywords: Computer-assisted Learning, Feedback, Mathematics/Numeracy, Secondary Education
Presenting Author: Larissa Altenburger, Leuphana Universität Lüneburg, Germany; **Co-Author:**Michael Besser, Leuphana Universität Lüneburg, Germany

The perception of the quality of two feedback types (knowledge of results and elaborated feedback) as well as its influence on students' performance is compared within the current study: 147 seven graders were assigned to either a less complex (knowledge of result) experimental or an elaborated experimental feedback condition. The two groups worked with a digital learning platform on fractions receiving feedback. Afterwards they completed a questionnaire on their perception of the feedback quality as well as a performance test on fractions. Results show no significant difference in the perception of the feedback quality of the two experimental groups. Likewise, no differences in performance have been found – however regression analyses suggest an effect of perception of elaborated feedback (but not of the less complex feedback type "knowledge of result") on students' performance. Relations to previous research as well as educational implications are discussed.

Formative assessment of early numerical concepts in Brazilian children
Keywords: Classroom Assessment, Inclusive Education, Mathematics/Numeracy, Primary Education
Presenting Author: Fernanda Rocha de Freitas, Universidade Federal de Minas Gerais, Brazil; **Co-Author:**Moritz Herzog, University of Wuppertal, Institute for Educational Research, Germany; **Co-Author:**Antje Ehlert, University of Potsdam / University of Johannesburg, Germany; **Co-Author:**Vitor Geraldi Haase, Universidade Federal de Minas Gerais, Brazil; **Co-Author:**Annemarie Fritz, Akademie Wort+Zahl, Germany

A substantial percentage of Brazilian children are struggling to learn basic numerical skills. Based on the empirically validated model of early numerical concepts, several instruments of the MARKO series have been designed to support children with mathematical learning difficulties. While originating from Germany, the MARKO instruments have been adapted in other countries, such in South Africa. The aim of the study is to evaluate the feasibility of using the model of conceptual numerical development and MARKO instruments for supporting Brazilian's children with math learning difficulties. N=135 Brazilian children from preschool, first and second grade were evaluated using MARKO-Screening via tablets by Hogrefe platform HTS-5. The MARKO-Screening was translated and adapted following the International Test Commission guidelines. A Rasch analysis was employed to estimate the difficulty of the items. Based on the infit statistics of the Rasch model, two items had to be excluded because of too high infit values. Except for three items, difficulty measures arranged as expected by model of numerical development's levels. While some items need reformulations for the assessment, in general the results also indicate that the MARKO instruments and the model of numerical concepts development might be used in Brazil for supporting children's mathematical learning.

Session K 17

24 August 2023 17:00 - 18:30
UOM_R05
Single Paper
Learning and Special Education

Reading Disabilities

Keywords: Cognitive Skills and Processes, Instructional Design, Learning and Developmental Disabilities, Mathematics/Numeracy, Primary Education, Reading, School Effectiveness, Secondary Education, Special Education, Teaching Approaches
Interest group: SIG 15 - Special Educational Needs, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Mayra Mascareño Lara, University of Groningen, Netherlands

Argumentative text comprehension by students with Reading Disabilities or Low Reading Achievement
Keywords: Instructional Design, Reading, Secondary Education, Special Education
Presenting Author: Anatoli Kirpouiki, University of Macedonia, Greece; **Co-Author:**IOANNIS AGALIOTIS, University of Macedonia, Greece

AbstractThe present study explored the effect of a systematic instructional intervention on the comprehension of argumentative texts by secondary students with Specific Reading Disabilities (SRD) and their peers with Low Reading Achievement (LRA). Eighteen students with SRD and 12 students with LRA attending the 1^{st} grade of Greek secondary schools (Gymnasia), were systematically taught via an instructional synthesis based on specific instructional objectives and the sequence of teaching phases of Systematic Explicit Instruction (SEI). The intervention lasted 10 weeks and involved 24 sessions (average duration of each session: 35min). Initial and final reading achievement of each group in Argumentative Text Comprehension (ATC) were compared through standardized and researcher-made tests. Parametric and non-parametric analyses showed that both groups presented statistically significant improvement in ATC. Post - procedure follow - up measurement verified the robustness of the findings on improvement. The results have important consequences for the implementation of reading instruction for secondary students with SRD or LRA, as they attest to the effectiveness of SEI and the importance of using instructional objectives in daily school practice. Keywords: Instructional Design, Reading, Secondary Education, Special Education

Text Comprehension Improvement in Struggling Readers via Explicit Instruction and a Reading Strategy

Keywords: Instructional Design, Reading, Secondary Education, Special Education
Presenting Author: Anatoli Kirpouiki, University of Macedonia, Greece; **Co-Author:**IOANNIS AGALIOTIS, University of Macedonia, Greece

AbstractAim of the present study was the investigation of the extent to which the combination of Systematic Explicit Instruction (SEI) with a Reading Strategy may bring improvement in the comprehension of argumentative texts by secondary students with Specific Reading Difficulties (SRD) or Low Reading

Achievement (LRA). Fifteen students with SRD and 15 students with LRA attending the 1st grade of Greek secondary schools (12-13 years of age), were taught via an instructional synthesis laying emphasis on specific instructional objectives, control of prerequisite knowledge, the sequence of teaching phases of SEI and the Repeated Readings Strategy (RRS). The intervention involved 24 sessions and lasted 10 weeks (session average: 35'). Initial and final reading achievements of each group in Argumentative Text Comprehension (ATC) were compared through standardized and researcher-made tests. Parametric and non-parametric analyses showed that both groups presented statistically significant improvement in ATC. Post - procedure follow - up measurement showed high level of knowledge maintenance. The results have important consequences for teaching reading comprehension at the secondary school level, as they prove that the combination of Systematic Explicit Instruction with the Repeated Readings Strategy may produce positive results for various groups of struggling readers. Keywords: Instructional Design, Reading, Secondary Education, Special Education

Working memory mediating word problem solving in students with and without reading disabilities
Keywords: Cognitive Skills and Processes, Learning and Developmental Disabilities, Mathematics/Numeracy, Primary Education
Presenting Author: Anastasia Chideridou-Mandari, Aristotle University of Thessaloniki, Greece; **Co-Author:**Sophia Giazitzidou, Dalhousie University, Canada; **Co-Author:**Susana Padeliadu, Aristotle University of Thessaloniki, Greece

Mathematical word problem solving involves several math skills and cognitive factors. Calculation skills and working memory have been both related to the word problem solving process. Further, students with reading disabilities are characterized by weak performance in both word problem solving and calculations and by working memory deficits as well. Despite the crucial role of working memory in mathematical performance, the interaction and the contribution of working memory and calculation skills in word problem solving remains unresolved. The aim of this study is to examine the mediating role of working memory in the relationship between calculation and word problem solving skills of primary school students with and without reading disabilities. Participants were 95 students with reading disabilities and 99 typically developing students from 4th and 6th grades. All students were assessed in number fact retrieval, written calculations and word problems (simple and complex). For working memory measurement, a phonological loop, a visuospatial sketchpad and a central executive task were administered. Separate path analyses for both groups demonstrated that within typically developing children, number facts and written calculation significantly contributed to word problem solving both directly and indirectly through visuospatial sketchpad. For students with reading disabilities, number facts and written calculation significantly affected word problem solving only directly. No significant mediation emerged from the analysis. Findings are discussed in the framework of developing educational interventions for teaching word problem solving skills.

Effectiveness of drama pedagogical reader's theater programs in special education
Keywords: Reading, School Effectiveness, Special Education, Teaching Approaches
Presenting Author: Jarkko Hautala, Niilo Mäki Institute, Finland; **Co-Author:**Enni Junttila, Niilo Mäki Institute, Finland; **Co-Author:**Miia Ronimus, University of Oulu, Finland; **Co-Author:**Roosa Karhunen, Niilo Mäki Institute, Finland

ReadDrama research project investigated the effectiveness of drama pedagogical reader's theater (RT) programs in promoting reading skills and motivation among struggling readers at elementary grades. While previous RT research has mainly utilized whole classroom programs of practicing and performing every week a new short text, our RT emphasized the drama pedagogical process of practicing and performing a complete play for the audience. The present paper summarizes the project findings from small-scale pilot study (N=22), large-scale randomized controlled trial (N=320) and from two (N=370, expected N=100) implementation studies. According to the result, drama pedagogical RT programs are equally effective than traditional targeted oral reading practice in promoting oral reading fluency in helping the struggling readers in catching up with their typically reading peers. However, no such benefit was observed for expressiveness in oral reading, silent reading fluency or reading comprehension. Moreover, the RT was well received by both male and female students and the goal to perform was found to lower anxiety associated with oral reading to others. Teachers were able to independently implement the RT according to manuals leading to reduced oral reading anxiety in their students. The presentation will end into discussion about the promise of RT with drama pedagogical emphasis to support struggling readers.

Session K 18

24 August 2023 17:00 - 18:30
UOM_A04
Single Paper
Educational Policy and Systems, Learning and Social Interaction, Teaching and Teacher Education

Linguistic Diversity in Multicultural Education

Keywords: At-risk Students, Attitudes and Beliefs, Early Childhood Education, Foreign and Second Language Acquisition, Inclusive Education, Migrant / Refugee and Minority students, Mixed-method Research, Multicultural Education, Quantitative Methods, Social Interaction, Teacher Professional Development
Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Iwan Wopereis, Netherlands

Linguistic diversity in Austria: challenges of including Ukrainian students into schools
Keywords: At-risk Students, Foreign and Second Language Acquisition, Inclusive Education, Migrant / Refugee and Minority students
Presenting Author: Flora Woltran, University of Vienna, Austria

In recent years, the linguistic diversity of students, mainly due to immigration movements forced by wars or economic crises, has become more important in school reality. As a first and immediate response, the Austrian Federal Ministry of Education has introduced so-called "classes with a German-Ukrainian focus" (CGUF), in which Ukrainian students are initially taught predominantly in their first language in separate classes until their German language skills are sufficient to participate in mainstream classes. Since the introduction of CGUF, there has been no research capturing the experiences of Ukrainian students and their teachers in Austrian schools. Therefore, problem-centered interviews were conducted to shed light on the practical implementation of CGUF and to identify barriers for students, teachers and school leaders. 15 teachers (14 female, 1 male) and 2 principals (both female) and 10 students (6 female, 4 male) from different types of schools (primary, lower and upper secondary) participated in the survey. Preliminary findings from a qualitative content analysis by Mayring (2015) suggest that teachers and principals from a variety of school sites report using both immersion programs and submersive models of language development. In addition, school staff report about a lack of support and clear information from education directorates. Finally, the results indicate that some of the staff working in CGUF do not have adequate training and expertise to provide language instruction to students as well as lacking pedagogical training. Students addressed lacking social participation with peers from regular classes as a significant issue.

Which turn to take? Using translanguaging to promote students' responsiveness in language classrooms
Keywords: Foreign and Second Language Acquisition, Multicultural Education, Quantitative Methods, Social Interaction
Presenting Author: Nienke Smit, Utrecht University, Netherlands; **Co-Author:**Jornt Holtman, Hanze University of Applied Sciences, Groningen, Netherlands; **Co-Author:**Marijn Van Dijk, University of Groningen, Netherlands; **Co-Author:**Wander Lowie, Faculty of Arts, University of Groningen, Netherlands; **Co-Author:**Marjolijn Verspoor, University of Pannonia, Veszprem, Hungary

Translanguaging, the pedagogical use of two or more languages in the same lesson, is a highly recommended practice in the foreign language (L2) classroom. However, thus far there are few quantitative empirical studies analyzing translanguaging behavior in the classroom. The present study analyzed 2594 pairs of teacher questions and student answers in a sample of 39 lessons. A cluster analysis identified four types of lessons based on the teachers' use of

translanguaging: (1) mainly L2 - low L2 response, (2) mainly L2 - high L2 response, (3) mainly L1 - low L2 response and (4) L2-L1 “translanguagers” – moderately high L2 response. A cluster analysis revealed mixed levels of student responsiveness when teachers adopt a monolingual stance (L2 only as the language of instruction). Lessons in cluster 4, the “translanguagers”, revealed a significantly higher level of student responsiveness. These results disclose the trade-off for teachers between (a) getting an answer and (b) getting an answer in the L2. Teachers who ask many questions in the L2, but receive few answers, may want to adopt translanguaging as a strategy to increase students’ active classroom participation. Strategically switching between different languages could help teachers to direct students’ response frequency and response language. We suggest that using the foreign language as the language of instruction and translanguaging are complementary, rather than competing, strategies in a language teacher’s repertoire.

Translanguaging stance of preschool teachers in Luxembourg
Keywords: Attitudes and Beliefs, Early Childhood Education, Mixed-method Research, Teacher Professional Development
Presenting Author: Gabrijela Aleksic, University of Luxembourg, Luxembourg

In 2017, the new law declared multilingual education mandatory in Luxembourg where there are 65% of 4-year-old language minority children. To support 40 teachers with the new law requirement that asked teachers to use children’s home languages in the classroom, we offered a 6-month professional development course in translanguaging pedagogy that builds on children’s full linguistic repertoire. Mixed methods were used such as focus groups, questionnaires, and video observations. Through pre- and post-course focus groups we identified three groups of teachers: (1) those with mild monolingual stance who believed that the most important is to develop children’s school language, Luxembourgish, (2) those with mild translanguaging stance who expressed that children’s home languages are important but can hinder children’s Luxembourgish, and (3) those with true translanguaging stance who believed that children’s home languages are necessary for their well-being and development of Luxembourgish. The questionnaires showed that there was a significant increase in teachers’ positive attitudes towards children’s home languages and translanguaging. However, in the video observations we identified both positive and negative examples in teacher-designed activities that, when compared to the focus groups and questionnaires results, seemed paradoxical but portrayed a fuller picture of preschool teachers’ translanguaging stance in Luxembourg.

Session K 19

24 August 2023 17:00 - 18:30
UOM_A07
Single Paper
Higher Education, Lifelong Learning

Sustainable Development in Higher Education

Keywords: Assessment Methods, Competencies, Curriculum Development, Higher Education, Instructional Design, Learning Approaches, Lifelong Learning, Social Aspects of Learning and Teaching, Sustainable Development, Teacher Professional Development
Interest group: SIG 04 - Higher Education, SIG 14 - Learning and Professional Development
Chairperson: Dieuwer ten Braak, University of Stavanger, Norway

Sustainable anchoring of assessment literacy in Higher Education
Keywords: Assessment Methods, Higher Education, Lifelong Learning, Teacher Professional Development
Presenting Author: Kyle Van den Langenberg, HAN University Nijmegen, Netherlands; **Presenting Author:**Jeroen van der Linden, HAN University of Applied Sciences / Maastricht University, Netherlands; **Presenting Author:**Kitty Meijer, HU University of Applied Sciences Utrecht; Open University of the Netherlands, Netherlands; **Co-Author:**Liesbeth Baartman, University of Applied Sciences Utrecht, Netherlands; **Co-Author:**Tamara Schilt-Mol, Hogeschool van Arnhem en Nijmegen, Netherlands

The professional development of assessment literacy of university lecturers has been on the agenda for some time now in the Netherlands. Professionalization in the field of assessment is one of the successes within higher education. Various reasons have led to further developed basic and senior qualification examination courses, the Protocol Graduation 2.0 and the Assessment Literacy Network. The project ‘With Open Eyes’, describing the ‘qualities of the assessment-literate university of applied sciences teacher’ (‘Je Ogen Uitkijken’ in Dutch), examines how the attention generated for assessment literacy can be sustainably anchored within the professional quality culture of universities of applied sciences in the Netherlands. The project includes nine goals, of which the third goal focuses on supporting development, adaptation and use of tools to promote and anchor assessment literacy. Nine universities engaged with an assessment issue in which the process of using the tools and the perceived outcomes were monitored through observation of meetings, logbooks and interviews with staff involved. These qualitative data were examined through thematic analysis using Atlas-Ti. Outcomes were validated through a member check. The results show that the structured professional dialogue, while working on assessment issues in practice, fed and guided by experts in networks, appears to be the best way to work on sustainable assessment literacy. This is in line with recent literature to construe assessment literacy from a sociocultural perspective. Further research can provide insight into whether these developments actually lead to sustainable assessment literacy.

Sustainability of teaching and learning innovations in higher education: a scoping review
Keywords: Higher Education, Instructional Design, Social Aspects of Learning and Teaching, Sustainable Development
Presenting Author: Margaret Bearman, Deakin University, Australia; **Co-Author:**Paige Mahoney, Deakin University, Australia; **Co-Author:**Helen Partridge, Deakin University, Australia; **Co-Author:**Harsha Chandir, Deakin University, Australia

Sustaining innovation and innovation dissemination is a topic of broad concern to higher education, particularly in a pandemic-driven time of challenge to the sector. This scoping review of the literature examines ten studies which have considered the sustainability of teaching and learning innovations within the past two decades. From these ten studies, we derive key drivers, barriers, and longitudinal insights into sustained innovations in higher education. Although there is consensus on the importance of staff engagement, collaboration and institutional funding, some contradictions emerged around the roles of funding, leadership and time. In almost all of the included studies, innovation was framed as an intrinsic benefit, which limited consideration of challenges or innovations that ceased to be useful. Although some conclusions about the sustainability of teaching and learning innovations may be drawn from existing studies, there is scope for further research which extends longitudinal understandings of how and why innovation may be sustained in higher education.

The impact of educational roles on student learning in transdisciplinary challenge-based learning
Keywords: Curriculum Development, Higher Education, Learning Approaches, Sustainable Development
Presenting Author: Gemma O'Sullivan, Eindhoven University of Technology (TU/e), Netherlands; **Co-Author:**Cassandra Tho, Wageningen University and Research Centre, Netherlands; **Co-Author:**Yvette Baggen, Wageningen University and Research Centre, Netherlands; **Co-Author:**Despoina Georgiou, Utrecht University, Netherlands; **Co-Author:**Heleen Pennings, UMC Utrecht, Netherlands; **Co-Author:**Antoine van den Beemt, Eindhoven University of Technology, Netherlands

Recent European, global, and institutional higher education policies call for transdisciplinary challenge-based learning (T-CBL) to develop in students the skills and competencies to deal with complex societal challenges, for example, in support of the United Nations Sustainable Development Goals. T-CBL requires students to work with external stakeholders and multiple disciplines to propose solutions to real-life challenges and to seek out information in non-traditional ways, for example, self-directed learning. This study examines what roles different actors play in T-CBL and how they contribute to student learning. In particular, this paper gives an insight into how students value these roles. Surveys were completed by 18 students taking part in inter-university challenges within a Dutch alliance of four universities. Semi-structured interviews were completed with 15 of these students. The results indicate that students place the highest value on the role of external stakeholders in T-CBL, however, other actors, for example, friends and family and fellow students are also valued. This paper discusses the implications of these findings, for example, how external stakeholders can be supported in T-CBL, how their perspectives can be integrated into curriculum design and student learning, and what role academic and administrative staff play in supporting T-CBL.

Keywords: higher education, challenge-based learning, sustainable development, transdisciplinarity, curriculum development

Learning to work across boundaries: developing boundary crossing learning trajectories in HE
Keywords: Competencies, Curriculum Development, Sustainable Development, Teacher Professional Development
Presenting Author: Judith Gulikers, Wageningen University, Netherlands; **Co-Author:**Karen Fortuin, Wageningen University, Netherlands; **Co-Author:**Cassandra Tho, Wageningen University & Research, Netherlands; **Co-Author:**Carla Oonk, Wageningen University, Netherlands

The competence to work together and co-create with others outside one's own scientific domain, culture or professional practice is a critical competence for graduates to respond to global challenges and deal with complex problems. In this context, Boundary crossing (BC) competence is crucial. We reflect on a four year university-wide educational innovation project for conceptualising, developing and implementing BC in education, draw lessons learned and identify success factors. In this participatory project, theoretical conceptualisation and practical development and design were ongoingly intertwined. The BC theory and its four learning mechanisms (identification, coordination, reflection, transformation; Akkerman & Bakker, 2011) are introduced. Four bachelor programs, guided by an interdisciplinary project team, used the BC theory and learning mechanisms to identify boundary crossing opportunities in their programs, develop learning goals, activities and learning trajectories. Besides, the project resulted in many other spin-offs in the universities (e.g. in Master programs, profiling new study programs etc.). We argue that the BC theory and learning mechanisms provide a solid foundation for implementing BC competence development in courses, curricula or learning trajectories. We show that BC can relatively easy be implemented in existing education, yet it is crucial to use experiential types of learning to make this rather abstract concept tangible for both teachers and students. A key learning gain of BC education is to see BC competence as a generic competence and boundaries, understood as demarcations of practices, as learning opportunities.

Session K 20

24 August 2023 17:00 - 18:30
AUTH_T202
Single Paper
Culture, Morality, Religion and Education, Higher Education, Motivational, Social and Affective Processes

Interventions to Reduce Anxiety and Improve Well-being

Keywords: Anxiety and Stress, Cognitive Skills and Processes, Emotion and Affect, Engagement, Higher Education, Mindsets, Motivation, Quantitative Methods, Social Sciences and Humanities, Vocational Education and Apprenticeship Training, Well-being
Interest group: SIG 08 - Motivation and Emotion, SIG 18 - Educational Effectiveness and Improvement, SIG 19 - Religions and Worldviews in Education
Chairperson: Telle Hailikari, Häme University of Applied Sciences, Finland

A Mindful Educational Intervention Program to Reduce Anxiety and Promote Self-esteem in Adolescence
Keywords: Anxiety and Stress, Mindsets, Social Sciences and Humanities, Well-being
Presenting Author: Victoria Zaroucha, The American College of Thessaloniki (ACT) - Anatolia College, Greece; **Presenting Author:**EVANGELIA GIANNOULI, The American College of Thessaloniki (ACT), Greece

Abstract Psycho-educational intervention programs including mindfulness in enhancing self-esteem and reducing anxiety have been infrequently studied in adolescence (Shahidi et al., 2017). Positive psychology interventions, though increasing in general, their effectiveness in adolescents is still scarce, especially in the school context (Tejada-Gallardo, et al. 2020). Research revealed that students with reading difficulties had higher anxiety as concerns reading and lower satisfaction and hope than the children without difficulties (Sainio, et al. 2019). Previous studies have shown that positive psychology interventions increase well-being and reduce anxiety and stress symptoms (Tejada-Gallardo, et al. 2020). In order to extent research on positive psychology, twenty-two randomly selected high school students, both male and female, from grades 4^{th} and 5^{th} (age 16-17) participated in a positive psychology intervention named "M.A.M.A.S" (Managing Anxiety Mindfully and Advancing Self-esteem). The students were native Greeks and form the experimental group in which the program was implemented. The study took place in a Model High School in Northern Greece. The experiment will be continued in another school during 2022-23 in order to have a larger sample than the above. So far, the intervention named "M.A.M.A.S" seems to have positive results on students' anxiety, self-esteem, and mindfulness.

Effect of a physical activity lifestyle intervention on mental wellbeing of VET students.
Keywords: Emotion and Affect, Quantitative Methods, Vocational Education and Apprenticeship Training, Well-being
Presenting Author: Mara Kirschner, Open University of the Netherlands, Netherlands; **Co-Author:**Rianne Golsteijn, Open University of the Netherlands, Netherlands; **Co-Author:**Roelina Kikkert, Open University of the Netherlands, Netherlands; **Co-Author:**Hans Savelberg, Maastricht Uiversity, Faculty of Health, Medicine and Life Sciences, Netherlands; **Co-Author:**Renate de Groot, Open University of the Netherlands, Netherlands

Problems regarding student mental wellbeing (SMW) are increasingly reported amongst vocational education and training (VET)-students. Research often shows that changing physical activity behaviour (PAB), i.e., increasing moderate to vigorous physical activity (MVPA) and decreasing sedentary behaviour (SB) is beneficial for SMW. Although especially the VET population is vulnerable for SMW problems, studies in this population are scarce. Therefore, this study aims to evaluate the effect of a physical activity (PA) based lifestyle intervention on PAB and SMW of VET-students. 126 VET-students were non-randomly allocated to a 20-week PA based lifestyle intervention or control group, following education as usual. PAB, subdivided in SB and MVPA, and SMW operationalized as lack of depressive symptoms (CES-D) and presence of self-esteem (Rosenberg self-esteem scale) were measured before and after the intervention. Repeated measures ANOVA revealed a significant time*group effect ($F(1, 89) = 8.40$, $p = .01$) for SB, indicating that SB decreased in the intervention group and increased in the control group. For MVPA only a significant negative main effect of time was found ($F(1, 89) = 5.74$, $p = .02$), thus both groups decreased significantly in MVPA over time. No effects of the intervention were found for depressive symptoms or self-esteem. Thus, the PA based lifestyle intervention only significantly decreased the amount of SB and had no effect on MVPA. Unfortunately, the intervention did not influence any of the concepts within SMW. Future research must investigate whether more intensive PA based lifestyle interventions are more effective in increasing MVPA and SMW.

Active recovery? - Effects of a physical activity break on student's attention and mood
Keywords: Cognitive Skills and Processes, Emotion and Affect, Motivation, Well-being
Presenting Author: Christian Müller, Freie Universität Berlin, Germany; **Co-Author:**Marianne Schuepbach, Freie Universität Berlin, Germany; **Co-Author:**Jil Wolf, Freie Universität Berlin, Germany; **Co-Author:**Sven Lindberg, University of Paderborn, Germany

More and more universities are offering physical activity breaks in seminars for the active recovery of student's learning conditions. However, the effects of physical activity breaks, especially in university classes, on cognitive performance and motivational learning conditions have not been adequately investigated, Therefore, the acute effects of a physical activity break within university seminars were investigated. By an intervention-control group design, the acute effects of a 10-min physical activity break (N = 63, Mage=23.74 years, SD = 4.36) within university seminars on student's attention and mood were investigated. In the physical activity intervention group student's attention (attention-processing speed: $p = < .05$, $\eta 2 = .062$, attention performance: $p = < .05$, $\eta 2 = .806$) and mood improved (feeling calmer: $p = < .05$, $\eta 2 = .071$; feeling more awake: $p = < .05$, $\eta 2 = .060$) compared to the control group. The results point to acute effects of physical activity breaks on student's cognitive and motivational learning conditions and the relevance of breaks in learning settings. At the conference possible moderation effects will be presented and transfer possibilities and limitations will be discussed.

University Students' Descriptions of Behavioral Changes During ACT-based Well-being Course
Keywords: Cognitive Skills and Processes, Engagement, Higher Education, Well-being
Presenting Author: Kristiina Räihä, University of Helsinki, Finland; **Co-Author:**Henna Asikainen, University of Helsinki, Finland; **Co-Author:**Nina Katajavuori, University of Helsinki, Finland

As there is a significant decrease in students' mental health, developing effective ways to enhance students' well-being in higher education is important. To face this need, an eight-week online Acceptance and Commitment Therapy (ACT) -based course for university students was developed. This study aims to produce new and deeper knowledge of the course participating students' described changes by applying the theory of behavioural change and the six processes of psychological flexibility (defusion, acceptance, values, committed action, present moment awareness, and self as concept). The qualitative data consist of course-participating university students (n=101, female 83%, male 15%, other 5%, mean age group = 20-30) written reflective learning reports that are analysed by abductive content analysis. The preliminary results of the data indicate that the most described changing psychological flexibility process was committed action. Students described positive behaviour related to committed action and resources such as social support and useful learning materials and exercises of the online course area to be change-enhancing factors. Correspondingly, the key description of change-preventing factors was students' negative behaviour associated with committed action, time management, and balancing study/ work and leisure time. One central description of change was also the need to change their goal, which students had set at the beginning of the course, thus implying that one key change during the course is the change in students' perspective of what needs to change. The results are further studied and discussed at the conference.

Session K 21

24 August 2023 17:00 - 18:30
UOM_R01
Poster Presentation
Assessment and Evaluation, Learning and Social Interaction

Assessment Methods and Evaluation

Keywords: Achievement, Assessment Methods, Competencies, Feedback, Large-scale Assessment, Primary Education, Quantitative Methods, Self-regulated Learning and Behaviour, Social Aspects of Learning and Teaching, Tool Development, Well-being, Writing/Literacy
Interest group: SIG 01 - Assessment and Evaluation, SIG 05 - Learning and Development in Early Childhood
Chairperson: Michalis Michaelides, University of Cyprus, Cyprus

How Fair is my Test?: A Ratio Coefficient to Help Represent Consequential Validity
Keywords: Assessment Methods, Large-scale Assessment, Quantitative Methods, Tool Development
Presenting Author: Denis Dumas, University of Georgia, United States; **Co-Author:**Yixiao Dong, University of Denver, United States; **Co-Author:**Daniel McNeish, Arizona State University, United States

The degree to which test scores can support justified and fair decisions about demographically diverse participants has been an important aspect of educational and psychological testing for millennia. In the last 30 years, this aspect of measurement has come to be known as consequential validity, and it has sparked scholarly debate as to how responsible psychometricians should be for the fairness of the tests they create, and how the field might be able to quantify that fairness and communicate it to applied researchers and other stake-holders of testing programs. Here, we formulate a relatively simple-to-calculate ratio coefficient that is meant to capture how well the scores from a given test can predict a criterion free from the undue influence of student demographics. We posit three example calculations of this Consequential Validity Ratio (CVR): one where the CVR is quite strong, another where the CVR is more moderate, and a third where the CVR is weak. We provide preliminary suggestions for interpreting the CVR, and discuss its utility in instances where new tests are being developed, tests are being adapted to a new population, or the fairness of an established test has become an empirical question.

Does assessors' expertise matter in comparative judgement of argumentative writing?
Keywords: Assessment Methods, Competencies, Quantitative Methods, Writing/Literacy
Presenting Author: Tine van Daal, University of Antwerp, Belgium; **Co-Author:**Marije Lesterhuis, UMC Utrecht, Netherlands

The role of the assessor is pivotal during comparative judgement of argumentative texts. This scoring method requires assessors to compare two texts and choose the best one. The outcomes of many comparative judgements are used to build a rank-order of texts. To make a comparative judgement, assessors must search for construct-relevant differences between the two texts, weigh this evidence, and choose the better text. Despite the claim that expertise is sufficient to make a valid comparative judgement, other studies have pointed out that comparative judgement can become difficult at times. Moreover, assessors are found to differ in their perception of difficulty and in the accuracy of their decisions. Although (lack of) expertise seems a plausible explanation for the latter findings, research on the impact of expertise in the context of comparative judgement of argumentative writing is currently lacking. Therefore, this study examined the impact of expertise on the perceived task difficulty and decision accuracy of comparative judgement. 15 experts and 15 non-experts comparatively judged the same batch of argumentative texts. Each assessor made seven judgements and rated the perceived difficulty of each judgement. The impact of expertise on perceived task difficulty and on decision accuracy was investigated using Bayesian generalized mixed-effect modeling. Results indicate that an expert perceives comparative judgement, on average, as less difficult than a non-expert. There are also indications of a positive impact of expertise on decision accuracy, but the evidence for this is inconclusive.

How can feedback support wellbeing? Suggestions from primary and secondary school teachers
Keywords: Assessment Methods, Feedback, Social Aspects of Learning and Teaching, Well-being
Presenting Author: Alessia Bevilacqua, University of Verona, Italy

A large amount of literature highlights the importance for a teacher to acquire feedback skills. Feedback practices allow for promoting learning by working not only through cognitive processes but also on the emotional dimension. This complex approach to feedback facilitates the promotion of both class and individual well-being of learners. While within Higher Education theories and practices regarding feedback have been widely developed, specific literature on feedback at primary and secondary school is lacking. This paper aims to present the results of a qualitative survey aimed at understanding how feedback practices can help promote well-being in primary and secondary schools. The feedback practices were collected through semi-structured interviews and analysed through inductive content analysis using the teacher and student feedback literacy models as a conceptual framework.Results highlight the feedback practices are aimed not only at promoting students' intrinsic motivation and self-esteem but also autonomy and awareness. In addition to feedback strategies that promote the active involvement of students, teachers pay close attention to the relational dimension of learning. However, these strategies are difficult to implement because the feedback culture is not yet widespread among teachers or students. Still dominating is the culture of grades, which does not promote well-being. Although the feedback literature and practices correlate with school and individual well-being, it is necessary to do more research on the specific role of emotions in feedback processes and focus attention on teachers' emotions so that they do not subconsciously influence the feedback processes.

Bidirectional links between educator-child relationship and children's regulation across preschool
Keywords: Assessment Methods, Quantitative Methods, Self-regulated Learning and Behaviour, Social Aspects of Learning and Teaching
Presenting Author: Carolina Guedes, Faculty of Psychology and Educational Sciences, University of Porto, Porto, Portugal, Portugal; **Co-Author:**Joana Cadima, University of Porto, Portugal

Previous studies have suggested that educator-child relationships influence children's regulation and interpersonal skills (Cadima et al., 2016; Jeon et al., 2021). Far fewer studies have examined how children's regulation skills in the classroom influence their relationship with their educators, with mixed evidence (McKinnon et al., 2018; McKinnon & Blair, 2019). The current longitudinal study aims to test the bidirectional interplay between educator-child relationships and children's regulation and interpersonal skills at ages 3 (T1) and 5 (T2). Participants were 89 Portuguese children (57% boys) with an average of 39.9 months (SD = 4.11) and their lead educators at T1 (n = 21) and T2 (n = 8). Relationships with target children were rated in three different domains: closeness, conflict, and dependency (STRS; Pianta, 2001) at each time point by the respective lead educators at that time. Educators also rated children's classroom behavior regulation and interpersonal skills at both time points with the CBRS (Bronson et al., 1990). Results showed that educator-child conflict and dependency at age 3 were negative predictors of children's interpersonal skills by age 5, controlling for child age and sex, previous interpersonal skills, and educator-child conflict and dependency. These findings add to the current discussion about the interplay between educator-child relationships and children's individual characteristics,

emphasizing the importance of relationships for children's interpersonal skills.

Developing Social Skills Universal Screeners for the Greek Elementary School
Keywords: Assessment Methods, Primary Education, Social Aspects of Learning and Teaching, Tool Development
Presenting Author: Lito Eleni Michalopoulou, Aristotle University of Thessaloniki, Greece; **Co-Author:**Constantinos Vouyoukas, Aristotle University of Thessaloniki, Greece

In universal screening processes for socio-emotional and behavioral (SEB) difficulties teachers typically complete brief behavioral Likert-type scales for each of their students in the classroom to determine behavioral risk status. In the international literature, various universal screeners have been developed and validated for use in elementary school settings. Taking into account the positive outcomes of universal screening practices in schools and their role in prevention efforts, the purpose of the current study was to develop, pilot, and evaluate three brief social skills rating scales. First, based on the existing literature and expert input, the researchers developed three teacher-completed brief rating scales measuring different aspects of social skills (Communication Skills, Prosocial Skills, and Social Self-Regulation), an important factor associated with SEB difficulties. After the initial scale development, the scales were piloted in a sample of 154 upper elementary students and 34 teachers. Results from this initial pilot revealed that all three constructed social skills scales had good psychometric properties, that is adequate internal consistency and evidence of content and construct validity. Last, the scales' predictive utility was assessed in predicting students' language achievement. In our presentation, we showcase how these scales can be used as universal screeners within a multi-tiered system of support approach for both socio-emotional and learning outcomes. Moreover, we discuss how these scales could be used as part of an evaluation process to help educators design appropriate social skills interventions based on students' strengths and needs.

A cross-cultural examination of rapid guessing behavior in international large-scale assessments
Keywords: Achievement, Assessment Methods, Large-scale Assessment, Quantitative Methods
Presenting Author: Michalis Michaelides, University of Cyprus, Cyprus; **Co-Author:**Militsa Ivanova, University of Cyprus, Cyprus

When test-takers do not invest adequate effort in low-stakes assessments, test scores underestimate the individual's true ability, and ignoring the impact of test-taking effort may harm the validity of test outcomes. Using item response times, this study examined examinees' rapid guessing behavior and accuracy in the Programme for International Student Assessment (PISA) across countries and different item types. The 2015 PISA computerized assessment was administered in 59 jurisdictions. Behavioral measures of students' test-taking effort were constructed for the Mathematics and Reading assessments by applying a fixed and a normative threshold on item response times to identify rapid guessing. The proportion of rapid guessers on each item was found to be small on average, about 3%, according to the normative and 1% with a fixed five-second threshold. Rapid guessing was about twice as high in human-coded open-response items, compared to simple and complex multiple-choice items, and computer-scored open-response items. Average performance for rapid guessers was on average much lower than for test-takers engaged in solution behavior for all types of items and more pronounced in Reading than in Mathematics. Weighted response time effort indicators by country were very high, and positively correlated with country mean PISA score. When filtering out examinees who were identified as rapid guessers, country mean scores improved, however the impact on country rankings was in general minor, if any. Computerized assessment programs may monitor rapid guessing behavior to identify cross-country differences prior to comparisons of performance and for developing interventions to promote engagement with the assessment.

Session K 22

24 August 2023 17:00 - 18:30
UOM_GYM
Roundtable
Instructional Design, Motivational, Social and Affective Processes, Teaching and Teacher Education

At-risk Students and Inclusive Education

Keywords: At-risk Students, Bilingual Education, Emotion and Affect, Foreign and Second Language Acquisition, Gender Issues, Inclusive Education, Motivation, Qualitative Methods, Quantitative Methods, Reading, Self-determination, Teaching Approaches
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education
Chairperson: Veronika Anselmann, University of Education Schwäbisch Gmünd, Germany

Gender, multisensory books, and LGBTQ-themed books in ECEC and school: A two-pronged scoping review
Keywords: Emotion and Affect, Gender Issues, Inclusive Education, Reading
Presenting Author: Radel James Gacumo, University of Stavanger, Norway

Inclusion is a relevant aspect of holistic education for children and youth. This is an encompassing notion that includes representation of diverse genders reflective of contemporary society. Gender has been narrowly represented in children's picturebooks. When children can connect and relate to the characters in the books they read, researchers found out that children are more likely to read, value the act of reading, and enjoy reading. In addition, researchers have documented that the strength of sensory memories are associated with potential value in children's experiences. The findings assert that sensory experiences are important to children in terms of meaningful recollection and activation of memories and experiences that impact children's development. Therefore, if the potential value of multisensory experiences activates memories and experiences impactful to children's development and LGBTQ-themed books allow the readers to experience "otherness" and the concept of diversity and inclusion, then it is timely to enquire how gender, multisensory books, and LGBTQ-books interplay with one another to enrich and improve the experiences of children and youth. The two-pronged scoping review aims to understand the overlap, the extent, and types of evidence that depicts notions of gender, gender diverse children's literature, and multisensory books, in ECEC and school contexts. To be included, the literature, which includes quantitative and qualitative study designs and grey literature, must involve children from 0 to 12 years old that report theories, projects, programs, policies, or interventions associated with the three notions that have been published digitally or in print.

Unraveling low-educated adults' motives for learning: a multidimensional perspective
Keywords: At-risk Students, Motivation, Qualitative Methods, Self-determination
Presenting Author: Bea Mertens, University of Antwerp, Belgium; **Co-Author:**Sven De Maeyer, Antwerp University, Belgium; **Co-Author:**Vincent Donche, University of Antwerp, Belgium

Adult secondary education (ASE) provides a second chance for adults who did not finalize secondary education, in order to prepare them for a lifelong learning trajectory. Although good-quality motivation is a pivotal component herein, participation rates in adult education among low-educated adults are low and dropout rates are high. As learning in adult education is voluntary, this study aims to gain a comprehensive understanding of motivational drivers of low-educated adults, and in doing so, to understand from a self-determination perspective both their motivation to participate in ASE and motivation to engage in learning every day. Semi-structured interviews were carried out with a purposive sample of high-level (n = 11) and low-level (n = 8) autonomously motivated ASE-learners. Both participation and learning motives were mapped by means of thematic analysis and subsequently deductively located on the self-determination continuum in order to capture the qualitative differences in motivational drivers for both types of motives. Multidimensional scaling and cluster analysis were used to explore the relationship between good- and poor-quality participation and learning motives and to identify homogeneous groups of respondents based on the their unique combination of both motivation types. This study not only adds to theorization by further unraveling the multilayered concept of motivation in adult education through a self-determination lens, but also contributes to educational practice by distinguishing between good- and poor-quality motivational profiles in this specific learning context.

Linguistic Complexity Analysis of English Bilingual Economics Materials from Germany
Keywords: Bilingual Education, Foreign and Second Language Acquisition, Quantitative Methods, Reading
Presenting Author: Luisa Scherzinger, University of Tübingen, Germany; **Co-Author:**Taiga Brahm, University of Tübingen, Germany; **Co-Author:**Detmar

Meurers, University of Tübingen, Germany

Due to globalisation, cooperation between companies and trade became increasingly international and English serves as lingua franca of global transaction processes. Accordingly, it is important to include intercultural and international topics in economic education and to foster students' language competences. Therefore, a bilingual implementation of economic education with English as additional language which enables the use of authentic task-based language teaching shows high potential for students' development of bilingual competences. For the idea of bilingual education to work, it is essential that the language in the textbooks satisfies two simultaneous demands, to be comprehensible to the target audience and to foster students' language development. In this work in progress, we therefore systematically analyse English bilingual economics materials in terms of their linguistic complexity and the language competence they require as expressed in terms of the Common European Framework of Reference for Languages. The materials include all existing English bilingual economics materials from German publishers (n = 25) ranging from textbooks to single lesson plans. We hypothesise that the language level of the materials is too difficult for the respective target group. If our hypothesis is confirmed, this would imply the necessity of a stronger focus on language (level) sensitivity for the development and selection of bilingual economics materials, which is highly relevant because German economic education faces a lack of teaching materials.

Comparative analysis of integrated and non-integrated education for prevocational students
Keywords: At-risk Students, Inclusive Education, Qualitative Methods, Teaching Approaches
Presenting Author: Charlotte Arnou, KU Leuven (BE), Belgium; **Co-Author:**Ingeborg Placklé, Vrije Universiteit Brussel, Belgium; **Co-Author:**Machteld Vandecandelaere, KU Leuven, Belgium

Challenged by the importance of basic literacy for all and teaching low achieving and struggling students, an evolving number of prevocational schools (grades 7-8) choose for integrated education. The underlying assumption is that integrated teaching facilitates transfer of competences and insights across disciplines and contexts. It enhances the chances on real life learning, which is engaging for students. Although integrated teaching is promoted by curriculum developers, teachers lack rationale for designing and implementing integrated teaching. This study aims to explore how integrated education is present in Flemish prevocational schools by comparing the integrated and non-integrated learning environments of 10 high and 10 low added value prevocational schools. The data is collected through videotaped classroom observations of 3 lessons of mathematics and 3 lessons of Dutch or 4 to 6 lessons of project integrated general subjects and semi-structured interviews with the teachers or teacher teams after the last lesson. In preparation of the observations, a random sample of school leaders, teacher leaders and teachers of 36 prevocational schools were interviewed. From these interviews, we can see that integrated education is shaped in different ways. Three approaches emerged from the interviews: thematic approach, project-based approach and the alternation of short-term project with periods of thematic lessons. The comparative analysis aims to provide a comprehensive and in-depth understanding of integrated education and its essential conditions and criteria.

Session K 23

24 August 2023 17:00 - 18:30
UOM_A10
ICT Demonstration
Teaching and Teacher Education

Do 'eye' see it all? Visualizing gazing patterns in a VR to support classroom management development

Keywords: Eye Tracking, Higher Education, Immersive Technologies for Learning, Pre-service Teachers
Interest group: SIG 11 - Teaching and Teacher Education

Please bring your own device if you are attending this ICT demonstration.
Every day teachers make decisions on how to manage their classrooms. However, selecting and applying effective Classroom Management Strategies (CMS) is one of the foremost concerns for teachers, especially when learning is situated in a dynamic kindergarten classroom. Pre-service teachers (PSTs) experience difficulties in deciding between proactive (e.g., eye contact) and reactive (e.g., disciplining) CMS when addressing specific behaviors. We developed an interactive Virtual Reality (VR) kindergarten classroom where PSTs can safely experience a variety of (disruptive) behaviors and experiment with different CMS. We also developed an eye-tracking integration that enables real-time visualizations of PSTs' gazing patterns, making it possible to provide tailored (peer)feedback. Moreover, the eye-tracking integration gives insight into PSTs' (un)conscious perceptions of (disruptive) behaviors, and it could offer a more objective evaluation of the VR environment and over-time CMS development. Our demonstration is open to all who would like to know more about using eye-tracking supported VR for training complex professional competences. We will start with a project overview (including theoretical and educational background, aims, methods, and findings). Participants can then experience the VR-kindergarten classroom and the potential of the eye-tracking integrations themselves. We will showcase different aspects of our classroom management software (i.e., the instructor module and the virtual kindergarten itself) and focus on the added value of two different real-time gazing patterns visualization techniques. Then there will be theopportunity to ask questions, exchange experiences with eye-tracking-supported VR, reflect on dilemma's, and discuss possibilities for applying eye-tracking in VR to participants' own educational and/or research practices.

Do 'eye' see it all? Visualizing gazing patterns in a VR to support classroom management development
Presenting Author: Jolien Mouw, University of Groningen, Netherlands; **Co-Author:**Marjon Fokkens-Bruinsma, University of Groningen, Netherlands

Please bring your own device if you are attending this ICT demonstration.
Every day teachers make decisions on how to manage their classrooms. However, selecting and applying effective Classroom Management Strategies (CMS) is one of the foremost concerns for teachers, especially when learning is situated in a dynamic kindergarten classroom. Pre-service teachers (PSTs) experience difficulties in deciding between proactive (e.g., eye contact) and reactive (e.g., disciplining) CMS when addressing specific behaviors. We developed an interactive Virtual Reality (VR) kindergarten classroom where PSTs can safely experience a variety of (disruptive) behaviors and experiment with different CMS. We also developed an eye-tracking integration that enables real-time visualizations of PSTs' gazing patterns, making it possible to provide tailored (peer)feedback. Moreover, the eye-tracking integration gives insight into PSTs' (un)conscious perceptions of (disruptive) behaviors, and it could offer a more objective evaluation of the VR environment and over-time CMS development. Our demonstration is open to all who would like to know more about using eye-tracking supported VR for training complex professional competences. We will start with a project overview (including theoretical and educational background, aims, methods, and findings). Participants can then experience the VR-kindergarten classroom and the potential of the eye-tracking integrations themselves. We will showcase different aspects of our classroom management software (i.e., the instructor module and the virtual kindergarten itself) and focus on the added value of two different real-time gazing patterns visualization techniques. Then there will be theopportunity to ask questions, exchange experiences with eye-tracking-supported VR, reflect on dilemma's, and discuss possibilities for applying eye-tracking in VR to participants' own educational and/or research practices.

Session K 24

24 August 2023 17:00 - 18:30
UOM_A06
ICT Demonstration
Higher Education

Virtual Reality and Theatre: Leveraging the Best of Both Worlds for Faculty Professional Development

Keywords: Higher Education, Immersive Technologies for Learning, Inclusive Education, Self-efficacy
Interest group: SIG 14 - Learning and Professional Development

Please bring your own device if you are attending this ICT demonstration.Our proposed ICT demonstration will showcase an innovative application of virtual reality (VR) that combines both artificial intelligence and human conversational intuition through an architecture called a “human in the loop.” The demonstration will involve two volunteers from the audience experiencing the simulation directly. The audience will be able to learn from the experience vicariously. The lead author will facilitate the conversation and show the utility of the tool in professional development specifically for advocating for more just, equitable, and inclusive academic workplaces. This tool has been used successfully with over 1,200 undergraduate and graduate students, and also faculty members in various university departments. The author will also present empirical results showing the development of learners’ self- and collective efficacy to create more just, equitable, and inclusive academic environments over a one-year period. Our demonstration and the presentation of the results of our intervention show a promising way forward in professional development specifically for diversity initiatives using an innovative application of VR. For educational theory, our tool also speaks to Bandura’s (1997) social cognitive theory, and how the four sources of efficacy beliefs can be leveraged and supported to help learners create a more just, equitable, and inclusive workplace climate.

Virtual Reality and Theatre: Leveraging the Best of Both Worlds for Faculty Professional Development
Presenting Author: Jason Chen, College of William and Mary, United States

Please bring your own device if you are attending this ICT demonstration.Our proposed ICT demonstration will showcase an innovative application of virtual reality (VR) that combines both artificial intelligence and human conversational intuition through an architecture called a “human in the loop.” The demonstration will involve two volunteers from the audience experiencing the simulation directly. The audience will be able to learn from the experience vicariously. The lead author will facilitate the conversation and show the utility of the tool in professional development specifically for advocating for more just, equitable, and inclusive academic workplaces. This tool has been used successfully with over 1,200 undergraduate and graduate students, and also faculty members in various university departments. The author will also present empirical results showing the development of learners’ self- and collective efficacy to create more just, equitable, and inclusive academic environments over a one-year period. Our demonstration and the presentation of the results of our intervention show a promising way forward in professional development specifically for diversity initiatives using an innovative application of VR. For educational theory, our tool also speaks to Bandura’s (1997) social cognitive theory, and how the four sources of efficacy beliefs can be leveraged and supported to help learners create a more just, equitable, and inclusive workplace climate.

Session K 25

24 August 2023 17:00 - 18:30
UOM_A05
ICT Demonstration
Learning and Instructional Technology

Supporting Teamwork in Technology-Enhanced Adult Learning Contexts

Keywords: Computer-supported Collaborative Learning, Educational Technologies, Lifelong Learning, Problem Solving
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Please bring your own device if you are attending this ICT demonstration.In recent years, collaborative problem solving (CPS) has been gaining importance in research and policy related to adult learning. There is however a need for tools (a) to design efficient and qualitative CPS activities and (b) to monitor and assess the quality of CPS activities. Furthermore, there is currently a lack of training materials to foster CPS competencies in adults in professional contexts. Within our project focusing on supporting teamwork, we therefore developed a new CPS curriculum for adults, based on principles of productive failure, and a set of tools (e.g. dashboards, virtual moderator) to support the coach and the learner during CPS activities in general. Our research project was a collaboration with two research groups and four Flemish industry partners, funded by imec and the agency Flanders Innovation & Entrepreneurship. During the ICT demonstration, we will give an overview of the tools and the training materials that we designed within the project.

Supporting Teamwork in Technology-Enhanced Adult Learning Contexts
Presenting Author: Siem Buseyne, Faculty of Psychology and Educational Sciences, Centre for Instructional Psychology and Technology, KU Leuven Kulak, Belgium; Itec, imec research group at KU Leuven, Imec; CIREL, Centre Interuniversitaire de Recherche en Education de Lille, France, France; **Presenting Author:**Annelies Raes, KU Leuven, Belgium; **Co-Author:**Robin De Croon, Augment, Department of Computer Science at KU Leuven, Leuven, Belgium, Belgium; **Co-Author:**Fien Depaepe, KU Leuven, Belgium; **Co-Author:**Francisco Gutierrez Hernández, Augment, Department of Computer Science at KU Leuven, Leuven, Belgium, Belgium; **Co-Author:**Kamakshi Rajagopal, Faculty of Psychology and Educational Sciences, Centre for Instructional Psychology and Technology, KU Leuven Kulak, Kortrijk, Belgium; Itec, imec research group at KU Leuven, Imec, Leuven, Belgium, Belgium; **Co-Author:**Tim Van Lier, VRT Sandbox, Vlaamse Radio- en Televisieomroeporganisatie, Brussels, Belgium, Belgium; **Co-Author:**Stéphanie Vanneste, Itec, imec research group at KU Leuven, Imec, Leuven, Belgium, Belgium; **Co-Author:**Katrien Verbert, Augment, Department of Computer Science at KU Leuven, Leuven, Belgium, Belgium; **Co-Author:**Amelie Vrijdags, Hudson Belgium, Brussels, Belgium, Belgium; **Co-Author:**Ine Windey, KU Leuven, Belgium

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Session L 1

25 August 2023 08:00 - 09:30
AUTH_DC3
Invited Symposium
Learning and Social Interaction, Teaching and Teacher Education

Creating spaces for children to meet uncertainty through play and playful learning

Keywords: Cognitive Skills and Processes, Competencies, Digital Literacy and Learning, Early Childhood Education, In-service Teachers, Learning Approaches, Peer Interaction, Primary Education, Qualitative Methods, Teacher Professional Development, Teaching Approaches, Teaching/Instructional Strategies
Interest group: SIG 28 - Play, Learning and Development
Chairperson: Valeska Grau Cardenas, Pontificia Universidad Católica de Chile, Chile
Discussant: Daniela Jadue Roa, Chile

Play behavior has been related to cognitive development, learning, creativity, and well-being. We are open to new possibilities, interact with others, and become more creative and lighthearted when we play. Therefore, including playful learning (PL) in education seems worthwhile.In educational terms, PL is a child-centered pedagogical approach that stimulates active learning through playful activities. Although early childhood educators tend to agree on the importance of play on children’s learning, this is often not reflected in their practice. Moreover, if we go beyond the early years, there is less agreement on the importance of play for learning. One of the issues relates to the facilitation of play. There isn’t much knowledge available on fostering learning through play at different ages or educational contexts, such as with a large classroom and diverse students. Likewise, the balance between structure and students’ autonomy tends to be a

common struggle among practitioners. The present symposium includes four studies from different parts of the world (Mexico, UK, Chile, and Denmark), including practitioners implementing learning through play at different educational stages, ranging from early childhood to adolescence. Despite the differences, they all dealt with common questions on the adequate type and amount of mediation and guidance provided to children, contextual issues related to implementation, and professional development needs. This collection of studies contributes to understanding the affordances and struggles embedded in implementing playful learning in different contexts across the globe.

Making Learning through Play Contextually Relevant and Effective: Case studies in Mexican ECE
Presenting Author: Dina Daniela Fajardo Tovar, University of Cambridge, UK, United Kingdom; **Co-Author:**Sara Baker, University of Cambridge, UK, United Kingdom

Learning through play (LtP) has gained momentum as a child-centred pedagogical approach that stimulates active learning through playful and developmentally appropriate activities (Parker & Thomsen, 2019). However, what does LtP in preschools imply for educators and their practice? Are educators supported by their context to extensively use LtP? The present study explores rural and urban Mexican educators' experiences of incorporating LtP in practice and the enablers and challenges they face to do so. In short, educators in both urban and rural preschools acknowledge the power of play. However, how they incorporate LtP in practice varies according to their attitudes, skills, knowledge, and other contextual factors. These findings shed light on how the context and its characteristics influence the understanding and practice of LtP in preschool. Furthermore, this study may inform future actions to support more LtP in Mexico and similar Latin-American contexts.

Sociodramatic Play as a learning tool: developing mediation skills in ECE through drama techniques
Presenting Author: Valeska Grau Cardenas, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Fernanda Rufs, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Belen Herrera, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Javiera Gonzalez, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Agustín Ramos, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Carolina Castro, Pontificia Universidad Católica de Chile, Chile

The study aimed to develop and evaluate a professional development program directed to early childhood educators (ECE) to promote SDP in their classrooms. Six classrooms and 18 ECE (3-4 years old) participated in this study. We collected 12 classroom videos (one before and one after the training in each classroom) and two focus groups with ECE. Two types of analysis were carried out with videos. We used the Mature play observation tool (MPOT) to assess sociodramatic play skills in children in the classroom context and a coding scheme constructed to allow the analysis of specific mediation behaviors concerning Play. Results show that ECE improved in several dimensions of both instruments. However, some dimensions did not show improvement, such as cognitive facilitation. Focus groups showed how ECE perceived the professional development programme as helpful for curriculum implementation and to motivate and encourage children to go to early childhood centers after a long period of confinement due to Covid-19. Theoretical and practical relevance for ECE professional development is discussed.

Teachers' views on implementing a playful approach to teaching writing skills
Presenting Author: Antonia Zachariou, Department of Psychology, Neapolis University Pafos, Cyprus / Faculty of Education, University of Cambridge, UK / Research Centre for Learning, Teaching and Human Development, School of Education, University of Roehampton, UK, Cyprus; **Co-Author:**Marisol Basilio, University of Cambridge, United Kingdom; **Co-Author:**David Whitebread, University of Cambridge, United Kingdom

The wider study set out to develop an intervention program with a playful approach to teaching narrative and writing skills. This paper aims to present the teacher's views regarding the intervention. Nine teachers in the UK implemented this guided-play intervention to teach writing skills with the use of LEGO building for an academic year. The teachers were interviewed upon completion of the intervention, through semi-structured interviews. The General Inductive Approach was employed in the analysis of the qualitative evaluation data collected through teachers' interviews. The results reveal the affordances and challenges of the intervention, changes in children's learning, and the intervention's impact on teachers' practice. Regarding the affordances of the intervention, the teachers talked about it enhancing motivation and engagement, creating a playful and relaxed environment, supporting self-regulation and metacognition, children receiving and providing feedback. As challenges, the teachers mentioned practical issues regarding time and space. Some elements of the teachers' responses came up as both affordances and challenges, such as providing choices to the children, collaborative work and skills. Regarding changes in children's learning, the teachers described that children's writing and collaborative skills improved and that the intervention enabled children's individual development in different aspects. Regarding the impact on teachers' practice, teachers' view of learning and teaching was transformed, as was their practice in other areas of the curriculum and their future practice.

Fostering student engagement and technology comprehension through playful teaching and learning
Presenting Author: Hanne Jensen, The LEGO Foundation, Denmark; **Co-Author:**Lisbet Baad Pedersen, University College South Denmark, Denmark; **Co-Author:**Stine Rauff Bommersholdt, Ramboll, Denmark

Abstract. Even before the pandemic, motivation and mental health have been declining among adolescents across Europe, with some links made to their use of social media and digital technologies. To explore solutions, staff and students at 12 schools were supported to experiment with playful learning with and about technologies. Early qualitative findings revealed higher engagement, a sense of flow and deeper learning among students. Staff noted needs for their role and guidance of students to change, balancing student agency and clear framing. Importantly, while more students actively participated in playful lessons, other student types struggled, especially those thriving with structure.

Session L 2

25 August 2023 08:00 - 09:30
AUTH_CH
Invited Symposium
Teaching and Teacher Education

To see the yet unseen – "critical aspects" as a key to developing teaching and students' learning

Keywords: Attitudes and Beliefs, Conceptual Change, Early Childhood Education, Instructional Design, Mathematics/Numeracy, Mindsets, Primary Education, Qualitative Methods, Reading, Synergies between Learning / Teaching and Research, Teacher Professional Development, Teaching Approaches, Teaching/Instructional Strategies, Writing/Literacy
Interest group: SIG 09 - Phenomenography and Variation Theory
Chairperson: Ann-Sofie Jägerskog, Stockholm University, Sweden
Discussant: Camilla Björklund, University of Gothenburg, Sweden

The aim of the symposium is to present and discuss the notion of "critical aspects" as a key concept for developing teaching and thus students' learning. The concept "critical aspects" is central to phenomenography and variation theory, pinpointing what aspects students need to discern in order to develop their understanding of the object of learning in focus for the teaching. In four different presentations, with a focus on different age groups and subjects, the notion of critical aspects is discussed. In the first presentation the authors discuss how critical aspects can be used by teachers in primary school as a point of departure in mathematics teaching – in tasks as well as activities. In the second presentation the authors discuss how teachers can help kindergarteners to discern critical aspects through reading a picture book. In the third presentation the author presents a study focusing on primary teachers' understanding of "growth mindset" and how critical aspects of this concept can be used as a foundation to inform teacher education. The final presentation discusses how teachers and teacher students understand the notion of critical aspects and what needs to be focused upon in teacher training in order for teachers/teacher students to grasp this concept in a qualified way. The symposium has scientific relevance as it opens up for different perspectives of a central concept in phenomenography and variation theory. It also has educational relevance, as the notion of critical aspects can be understood as foundational for developing teaching.

Critical aspects as a foundation for a teaching program for early arithmetic skills

Presenting Author: Angelika Kullberg, University of Gothenburg, Sweden; **Presenting Author:**Anna-Lena Ekdahl, Jönköping University, Sweden

In this paper we discuss the implementation of a one-year teaching program for six-year-old pupils' learning about numbers and addition and subtraction based on teachers' enactment of critical aspects. A goal with the program was that the pupils would learn to structure numbers up to 12 in part-whole relations, and by that develop sustainable strategies for solving addition and subtraction problems in long-term. The paper aims to illustrate how critical aspects were used to communicate what was considered necessary to be brought to the fore in teaching to develop the requested capability. We will show how critical aspects and patterns of variation were used by the teachers in tasks and activities as points of departure for teaching. An important part of the implementation of critical aspects was the iterative process of planning and analysis of video recorded teaching where the critical aspects was discussed. How the program and the critical aspects affected student learning are also shown. The findings have major implications for teaching arithmetic in early grades.

Identifying critical aspects of picture book reading for kindergarteners as hope in uncertain times
Presenting Author: Wai Ming Cheung, The University of Hong Kong, Hong Kong; **Co-Author:**Serene Chan, University of Hong Kong, Hong Kong

Discerning critical aspects in a lesson is a steppingstone to teaching and learning, and is possible even with young children in kindergarten. This presentation will discuss a Learning Study conducted in a kindergarten with a focus on critical aspects about transitioning to primary school. The lessons made use of a picture book called "What does a Primary One Student Do?" written by the first author. The picture book was specifically written to help children learn about life in primary school and be better prepared for the transition. Patterns of variation were already embedded in the sentences in the picture book. Two teachers and 15 children of 5-6 years old participated. After reading the picture book, the teachers helped the children learn key vocabulary about primary school life. Findings from the lesson observations showed that the children were able to discern the critical aspects through a pattern of variation and invariance presented by the teachers. The children could mention key actions done by primary students and they could also identify with characters in the picture book. This study shows the importance of helping young children discern critical aspects of the object of learning through variation in the learning process. This is a key to learning which provides hope in uncertain times of COVID-19 and the unknowns of transitioning to primary school.

Using critical aspects in social science: Teacher conceptions of growth mindset in primary school
Presenting Author: Will Zoppellini, Solent University Southampton, United Kingdom

Growth mindset is the belief that human qualities such as intelligence are malleable and can be improved with the use of learning strategies and effort (Dweck 2008). Previous research indicates that students who develop a growth mindset have higher levels of academic success and resilience (Yeager et al 2019; Paunesku et al 2015). The implementation of growth mindset into education has started to divide opinions amongst teachers and scholars globally, and teachers have begun to express different interpretations of the concept and how to develop it with children (Dweck & Yeager 2019). This study used a phenomenographic approach to examine primary school teachers' conceptions of growth mindset in England, and their related pedagogic approaches. Findings suggest that there are varying conceptions amongst teachers that informs their use of growth mindset in education. Within Phenomenography, critical aspects denote the key differences between conceptions that teachers need to discern to move from a less to more comprehensive way of understanding growth mindset. Within phenomenography research examining social science in teaching has been given less attention than the physical sciences. This presentation uses the findings from the current study to discuss examples of how critical aspects are created in social science research and identifying the issues involved in this process. Furthermore, the presentation includes considerations for turning the critical aspects of the research into teacher education.

Focal points for teaching the notion of critical aspects
Presenting Author: Malin Tväråna, Uppsala University, Sweden, Sweden; **Presenting Author:**Anja Thorsten, Department of Behavioural Sciences and Learning, Sweden

Variation Theory, and especially the concept "critical aspect", is a powerful tool for teachers when designing teaching. When teacher educators teach the notion of critical aspects to teachers/teacher students, their teaching will be improved if the educators know what learners need to discern to understand and use the notion of critical aspects as a pedagogical tool. In this study this is explored by using phenomenography to analyse written material from teachers undergoing an introduction to Variation Theory. The study identifies five qualitatively different conceptions of the notion of critical aspects. By comparing the differences between these conceptions, four aspects were identified that address what the teachers need to discern to perceive the notion of 'critical aspects' in the targeted way. The teachers need to discern that critical aspects address a) the subject content, b) students' understanding, c) different aspects of the object of learning and d) focus in teaching.

Session L 3

25 August 2023 08:00 - 09:30
UOM_A04
Symposium
Cognitive Science

Executive functions in science and mathematics: From cognitive neuroscience to applied research

Keywords: Cognitive Skills and Processes, Educational Neuroscience, Mathematics/Numeracy, Primary Education, Reasoning, Science Education
Interest group: SIG 22 - Neuroscience and Education
Chairperson: Reuven Babai, Tel Aviv University, Israel
Organiser: Reuven Babai, Tel Aviv University, Israel
Organiser: Roland Grabner, University of Graz, Austria
Discussant: Iro Xenidou-Dervou, Loughborough University, United Kingdom

The symposium focuses on executive functions form different viewpoints. Our aim is to combine knowledge obtained by basic research studies in the domains of psychology, neuroscience and neuroeducation, with practical suggestions and education implications obtained mainly by applied research in education. The symposium presentations will relate to executive functions in science and mathematics and to different age groups. The first presentation will relate to the COVID effect on the development of children's math and executive-functioning skills in early ages. The next presentation will relate to domain-specific and domain-general correlates related to conceptual change in mathematics. Another presentation will address the involvement of executive functions in scientific reasoning and shed more light on the variables that may influence the use of and need for such inhibitory control and the potential implications of these findings. The last presentation will describe a general intervention program, aimed at activating students' executive functions, based on recent neuroeducation studies. This presentation will illustrate the effect of such intervention on junior high school students' achievement in science. Overall, the symposium is aimed at bridging basic research findings from studies carried out in recent years and practical educational implications.

Effect of COVID related school closure on kindergarten's math and executive functioning development
Presenting Author: Kerry Lee, The Education University of Hong Kong, Hong Kong; **Co-Author:**Jin Sun, The Education University of Hong Kong, Hong Kong; **Co-Author:**Sum Kwing Cheung, The Education University of Hong Kong, Hong Kong; **Co-Author:**Alfredo Bautista, The Education University of Hong Kong, Hong Kong

The COVID pandemic has resulted in unprecedented disruption to children's schooling worldwide. Hong Kong had prolonged school closures from early 2020 to the first half of 2021. This closure hit the preschool sector particularly hard with teachers scrambling to assemble online teaching material for children who were stuck at home with their caregivers. This study presents data from a naturalistic experiment in which we compared the development of children's math and executive-functioning skills across two cohorts (N = 234, Mage = 53.57 months). Pretest data from the first cohort were collected just before the pandemic while they were in the second year of kindergarten (K2). Posttest was conducted one-year later together with pretest from the second cohort who were also in K2. The latter was administered the posttest one year later. Preliminary analyses showed no differences in executive functioning between the two cohorts either at pretest or posttest. Unexpectedly, children in the second cohort performed better than the first cohort on the math measures even though they had missed the

first year of kindergarten. These differences no longer attained significance at posttest. The importance of home based activities for children's early numearcy development is discussed.

Domain-specific and domain-general correlates of the conceptual interference effect in mathematics
Presenting Author: Roland Grabner, University of Graz, Austria; **Co-Author:**Tim Hohensinn, University of Graz, Austria; **Co-Author:**Katharina Longitsch, University of Graz, Austria; **Co-Author:**Simon Riedl, University of Graz, Austria; **Co-Author:**Johannes Woschizka, University of Graz, Austria; **Co-Author:**Stephan Vogel, University of Graz, Austria

In research on conceptual change, there is increasing evidence that scientific theories do not replace learners' naïve theories but co-exist with them in memory. This has been demonstrated using speeded-reasoning tasks in which participants showed worse performance in evaluating science statements whose truth value differed between naïve and scientific theories (incongruent) compared to those with the same truth value (congruent). This conceptual interference effect (CIE) has been attributed to a cognitive conflict in incongruent statements whose solution requires the active inhibition of the naïve theory. However, the individual strength of the CIE has not been found to be correlated with interference effects in executive function tasks drawing on inhibition, raising the question whether such an association emerges with domain-specific and process-related inhibition tasks. In addition, little is known about associations of the CIE with domain-general and domain-specific ability measures. We investigated these questions using a speeded reasoning task in mathematics. Results from 80 adults revealed strong correlations of the CIE with mathematical competencies and moderate ones with working memory tasks, but null correlations with interference effects from three numerical inhibition tasks. These findings demonstrate the ecological validity of the CIE regarding domain-specific, and to a smaller extent domain-general, abilities, and provide first evidence that domain-specific inhibitory control measures are unrelated to the CIE. This adds further evidence to the open question of the actual type of inhibition (or other executive function) processes in overcoming naïve theories.

Overcoming misconceptions in scientific domains requires inhibitory control: overview and next steps
Presenting Author: Genevieve Allaire-Duquette, Université de Sherbrooke, Canada; **Co-Author:**Lorie-Marlène Brault Foisy, Université du Québec à Montréal (UQAM), Canada; **Co-Author:**Patrice Potvin, Université du Québec à Montréal, Canada

An extensive research literature reveals that students hold misconceptions about various phenomena. These misconceptions are important to consider, since they interfere with the learning of scientific concepts and can therefore make formal instruction less efficient. An example of such common misconception could be to believe that bigger or heavier objects sink more, which constitutes an obstacle in learning buoyancy. Furthermore, it has been shown that those misconceptions do not only interfere during learning; they also persist after being given formal instruction and thus make it hard to foster conceptual change. In the last decade, a growing number of studies have suggested that inhibitory control mechanisms would play an important role in science learning, for many scientific domains. Inhibitory control would indeed allow to resist misconceptions in order to select and reason according to the scientific concept, when the situation requires it. Moreover, several tools have been used to detect the mobilization of inhibitory control in the context of scientific reasoning, such as functional magnetic resonance imaging (fMRI), electroencephalography (EEG) and reaction times. The aim of this presentation is twofold: 1- provide an overview of the most recent evidence regarding the involvement of inhibitory control in scientific reasoning and 2- present the initial results of a research project investigating the variables that may influence the use of and need for inhibitory control in science. The potential implications of these results for science education will also be discussed during the presentation as well as future directions of research.

Intuitive interference intervention improves junior high school students' achievement in chemistry
Presenting Author: Reuven Babai, Tel Aviv University, Israel; **Co-Author:**Najla Madback, Tel Aviv University, Israel

Students encounter many difficulties in science and mathematics, some of which are thought to stem from intuitive interference. Such mistakes are influenced by salient irrelevant variables of the task, as in the comparison of perimeter task. This task was studied by cognitive neuroscience methodologies. Accuracy, reaction time, and neural correlates (by fMRI) were measured, while participants compared perimeters in congruent and incongruent conditions. It was found that in the incongruent condition accuracy drops and reaction time is longer. In addition, prefrontal brain regions were activated when answering the incongruent condition correctly, suggesting that inhibitory control mechanisms are activated in order to overcome the interference. An intervention study indicated that giving a warning regarding the irrelevant salient variable increases success rate in incongruent trials and increases reaction time, indicating that students' executive functions were activated by this intervention.The present study examined whether a general intuitive interference intervention would improve junior high school students' achievements in chemistry. Eighty-five eighth and ninth graders were divided into two groups, control and intervention. Students in the intervention group participated in a one-session workshop (90 min) on intuitive reasoning aimed at activating their executive functions. This intervention was inspired by neuro-education studies that suggested that students' awareness of brain activity might influence their thinking patterns. The intervention group outperformed the control group in the posttest science exam, while no difference was observed between the groups in the pretest science exam. Implications of this study will be discussed.

Session L 4

25 August 2023 08:00 - 09:30
AUTH_DC1
Symposium
Instructional Design, Learning and Instructional Technology

Put your hands on the task! The use of finger pointing and tracing to support multimedia learning

Keywords: Cognitive Skills and Processes, Comprehension of Text and Graphics, Educational Technologies, Example-based Learning, Eye Tracking, Instructional Design, Learning Strategies, Meta-analysis, Multimedia Learning, Teaching/Instructional Strategies
Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Björn de Koning, Erasmus University Rotterdam, Netherlands
Organiser: Shirong Zhang, Netherlands
Organiser: Björn de Koning, Erasmus University Rotterdam, Netherlands
Discussant: Cris Castro, University of Birmingham, United Kingdom

Multimedia learning combines different types of media including text, pictures, video, and sound, enabling a rich and sensory learning experience. In the past decades an enormous amount of research has investigated how to best make use of the visual and auditory modalities during multimedia learning, which has resulted in numerous instructional design principles for effective multimedia learning. This symposium joins a relatively recent and emerging focus in multimedia learning research, namely the involvement of the motor system to foster learning. There is increasing awareness that human movements, particularly hand movements such as gestures, are not just an output of thinking but can also support learners' cognitive processing, thus increasing learning.
All contributions in this symposium investigate the use of hand movements, specifically finger pointing and/or tracing, to support multimedia learning. Three empirical studies investigated pointing (contribution 1), pointing combined with tracing (contribution 2), and a direct comparison between pointing and tracing (contribution3). The contributions cover a variety of paper-based and computer-based learning tasks. Product-oriented measures (learning outcomes and cognitive load) were supplemented with process-oriented measures (eye-tracking/gaze behavior) in two studies enabling insights into underlying mechanisms. Deeper insights are also provided by a meta-analysis about pointing and tracing (contribution 4). A joint discussion will be stimulated by a highly-productive scholar in educational psychology with extensive expertise about human movement in learning. Expected outcomes of the symposium are a better understanding of the effectiveness of pointing and tracing in multimedia learning, the (im)possibilities regarding practical use, and informing design of future studies.

Mouse Pointing to Support Learning From Labeled and Unlabeled Split-Attention Materials
Presenting Author: Shirong Zhang, Delft Univeristy of Technology, Netherlands; **Co-Author:**Björn de Koning, Erasmus University Rotterdam, Netherlands; **Co-Author:**Fred Paas, Erasmus University Rotterdam, Netherlands

We investigated the effects of mouse pointing as a strategy performed by learners to support learning from online labeled and unlabeled split-attention materials, in which the mutually referring but spatially separated text and picture needed to be linked. Eye tracking was used to uncover how mouse pointing and labeling affected the learning process. One hundred thirty-two university students were randomly assigned to one of four conditions that resulted from a 2 (Mouse Pointing Instruction: yes vs. no) × 2 (Labeling: yes vs. no) between-subjects design. Participants studied a text and picture about the human nervous system in a split-attention format and after that learning outcomes (i.e., retention, comprehension) and cognitive load were measured. Eye movements indices comprised fixations on the text and picture and transitions between the text and picture during learning. Results showed that neither mouse pointing nor labeling had a significant impact on learning outcomes and cognitive load ratings. However, there was an interaction between mouse pointing and labeling on comprehension test performance, indicating that participants using mouse pointing with labeled materials performed worse than those who used mouse pointing with unlabeled materials. Eye tracking results revealed that both mouse pointing and labeling led to shorter fixation duration and a lower number of fixations on the text and more transitions between text and picture. Labeling led to longer fixation duration and more fixations on the picture. Together, these results suggested that mouse pointing and labeling influence perceptual but not cognitive processing in learning from split-attention materials.

To Trace or Not to Trace: Mimicry in Timed Multimedia Lessons with Pointing and Tracing
Presenting Author: Stoo Sepp, University of New England, Australia, Australia; **Co-Author:**Shirley Agostinho, University of Wollongong, Australia; **Co-Author:**Sharon Tindall-Ford, University of Wollongong, Australia; **Co-Author:**Fred Paas, Erasmus University Rotterdam, Netherlands

Performing hand gestures such as pointing and tracing while learning is an area of increasing focus in educational research. Previous studies have found that when participants performed these gestures while engaging with learning materials on paper or computer screens, they performed better on posttests in multiple learning areas, including health sciences, mathematics, and language learning. In this study, the effects of mimicking pointing and tracing gestures while learning in a guided (timed) multimedia lesson on an iPad were investigated. Participants were asked to perform or mimic pointing and tracing gestures while engaging with timed video lessons presenting worked-examples in geometry. Results showed that participants who performed pointing and tracing gestures achieved lower test scores than those who did not, suggesting that these gestures may not have the same positive effect when compared with learning with materials such as paper worksheets. On top of the auditory and visual information presented, the addition of hand gestures may require more cognitive resources to manage, leading to lower test scores. More research is needed into the complex cognitive processes involved in physically engaging with multimedia learning materials, as well as the role that individual differences may play in such learning environments.

Tracing or Pointing? An eye-tracking study on how learners benefit from using the hands for learning
Presenting Author: Roland Bruenken, Saarland University, Germany; **Co-Author:**Babette Park, University of Education Freiburg, Germany, Germany; **Co-Author:**Andreas Korbach, Saarland University, Germany; **Co-Author:**Paul Ginns, The University of Sydney, Australia

The present study uses eye-tracking in order to test whether learners benefit from pure pointing compared to learners using tracing or no tactile method (pointing vs. tracing vs. no touch). The results replicate previous findings demonstrating benefits of tracing while learning, and provide additional support for the hypothesis that fingers support learning by directing attention. This is due to the fact that the learning group using pure pointing outperformed, especially in comprehension performance, the no-touch learning group and the learning group that used tracing gestures. Eye-movement analysis indicated the pure pointing group profited from a higher focus of visual attention and more intense cognitive activity. The question of why the tracing group did not show this same benefit is discussed by considering previous studies and the limitations of the present study. It seems as if the present study does not replicate a previous study. However, when reflecting on the different control group design, the present study delivers additional information on how using fingers affects learning. Finally, resulting research questions are derived from the present study for further research on gesturing in the frame of embodied cognition.

Multimedia learning through tracing and pointing: A meta-analysis
Presenting Author: Paul Ginns, The University of Sydney, Australia

Cognitive load theory's evolutionary foundations hold that biologically primary knowledge based in the body can be harnessed to support learning complex, biologically secondary topics. This theorising has informed experimental research on effects of advising students to "use your hands to help you learn", including making pointing and tracing actions against the surface of lesson materials with the index finger while studying. The present study meta-analyses findings from both published and unpublished experimental studies using the same pre-lesson instructions to "use your hands to help you learn". Correlation matrices from eight studies ($N = 321$) were synthesised to estimate average correlations between key variables, including prior knowledge, instructions to point and trace (as an independent variable), intrinsic cognitive load, extraneous cognitive load, and post-lesson test scores (Knowledge of specifics, and Comprehension). Instructions to point and trace resulted in lower self-reported intrinsic and extraneous load, with a more substantial average effect on extraneous load. Instructions to point and trace also resulted in higher performance on post-lesson test scores. Moderator analysis focusing on post-lesson test scores indicated studies allowing students to self-pace their study across specific lesson pages generated larger effects than those where student progress was system-paced. In addition, studies using process measures such as eye-tracking and secondary tasks generated smaller effects than studies that did not use such measures. The study's findings stand to inform design of future investigations, and broadly support the use of pre-lesson advice to make pointing and tracing actions while studying as a simple, zero-cost learning strategy.

Session L 5

25 August 2023 08:00 - 09:30
UOM_A12
Symposium
Cognitive Science

Analogy supports individuals in harnessing the uncertain

Keywords: Anxiety and Stress, Cognitive Development, Cognitive Skills and Processes, Early Childhood Education, Educational Neuroscience, Example-based Learning, Mathematics/Numeracy, Primary Education, Problem Solving
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Katarzyna Bobrowicz, University of Luxembourg, FLSHASE, Luxembourg
Organiser: Jean-Pierre Thibaut, Université de Bourgogne / Lead - CNRS, France
Discussant: Anke Maria Weber, University of Luxembourg, Luxembourg

Nothing happens twice, at least in precisely the same way. However, analogical situations happen all the time and the ability to identify, map and apply relational structures shared by such situations allows individuals to harness the all-pervading, everyday uncertainty. This makes analogy central to education as a means of boosting students' acquisition and generalization of knowledge and skills, supporting them in solving never-seen situations, and participating in the democratic society. In this symposium, we showcase our research on analogical thinking, reasoning and transfer in preschoolers and primary school students to show why analogy should take centre stage in early childhood and primary education. The symposium will begin with a focus on early childhood and the key ability of disregarding irrelevant information in successful analogy-making. Paper 1, authored by [Blinded], will discuss mechanisms behind early analogy-making, and inhibiting attention to irrelevant information. Paper 2, by [Blinded], will report on an ongoing study wherein preschoolers are tasked with disregarding irrelevant, distracting or misleading, information. Paper 3, by [Blinded], will discuss whether 6-year-olds were sensitive to the quality of analogical explanations, and, finally, Paper 4, by [Blinded], will highlight the importance of analogies in pedagogical practice stimulating higher-order thinking in primary school children. The contributors will be joined by [Blinded], serving as a Discussant. Despite the multi-decade interest in analogy, its mechanisms, function and role in the educational context remains understudied. With this symposium, we hope to jointly discuss our research under the theme of EARLI 2023.

Children and Adults Adapt their Search Strategy to Analogy Task Requirement. An Eyetracking Approach
Presenting Author: Jean-Pierre Thibaut, Université de Bourgogne / Lead - CNRS, France

Analogical reasoning is a common comparison situation in daily life, when adults or children compare and align different semantic domains. According to most

models (Gentner & Forbus, 2011), successful analogical reasoning requires comparisons within and between the conceptual domains in order to uncover shared relations. We compare children's and adults' search strategies underlying analogical mapping with eye-tracking data. We compared two analogy formats and tested whether children follow the same strategies across analogy formats. We compared six-year-old children and adults in scene analogies (finding an item playing the same role in two semantic scenes) and a classical A is to B what C is to … D? format. We hypothesized (1) both groups would first explore the Base then the Target domain (2) that adults would be more focused on the A-B pair in early moments in both conditions, (3) that children would have more gazes at the distractors. Results showed that children and adults followed the same strategy (H1): first exploring the base domain (A&B), later the target domain. H2 and H3 were also confirmed: children were less focused on the Base domain than adults at the beginning and had more gazes or more transitions towards distractors than adults. We confront these results to existing models of analogical reasoning and interpret differences between children and adults in terms of control processes (EF) (e.g. difficulties to inhibit distractors) rather than in terms of a lack of knowledge.

Distracted and Misled, Yet Capable of Transfer: Analogical Transfer in 2.5- to 5.5-Year-Olds
Presenting Author: Katarzyna Bobrowicz, University of Luxembourg, FLSHASE, Luxembourg; **Co-Author:**Anke Maria Weber, University of Luxembourg, Luxembourg; **Co-Author:**Angélica Mendes, University of Luxembourg, Faculty of Language and Literature, Humanities, Arts and Educational Sciences (FLSHASE), Luxembourg; **Co-Author:**Alicja Jamroga, University of Luxembourg, Faculty of Language and Literature, Humanities, Arts and Educational Sciences (FLSHASE), Luxembourg; **Co-Author:**Samuel Greiff, University of Luxembourg, Faculty of Language and Literature, Humanities, Arts and Educational Sciences (FLSHASE), Luxembourg

Analogical transfer, the ability to generalize a solution onto a seemingly different but functionally similar problem, has the potential to boost individual learning beyond similar-looking situations. However, analogical transfer also involves another ability that is key for efficient learning and may be supported early in education: the ability to disregard irrelevant information in favour of relevant information. Supporting this ability in early childhood education has implications not only for learning but also well-informed participation in the democratic society, which heavily relies on evaluating arguments in terms of their relevance for a given subject. To date, analogical transfer was repeatedly investigated in young children, but their ability to prioritise truly relevant over irrelevant, distracting or misleading, information remains understudied. Therefore, in this study, we tested whether children between 2.5 and 5.5 years (N = 41, ongoing) could transfer relevant information despite irrelevant, distracting or misleading, information. Children participated in a play session at day-care facilities, where they attempted to transfer relevant tool-use knowledge across two analogical problems despite a distracting or a misleading problem solved in between. Preliminary results suggested that children younger than 40 months were not capable of disregarding either type of irrelevant information, and the likelihood of disregarding both distracting and misleading information was the highest in 4.5- to 5.5-year-olds. The data collection is ongoing, and, as measures of world knowledge and executive functions are gathered alongside performance on analogical transfer, the study may inform future interventions focused on relevant cognitive capacities beyond child's age.

Explaining with Spontaneous Analogies
Presenting Author: Yang Gao, Tsinghua University, China; **Co-Author:**Kexing Que, Tsinghua Laboratory of Brain and Intelligence, Tsinghua University, China; **Co-Author:**Stella Christie, Department of Psychology, Tsinghua Laboratory of Brain and Intelligence, Tsinghua University, China

Analogy plays a prominent role in classroom learning, but little is known on how analogy is spontaneously generated. Here we fill this critical gap by gathering parents' answers to children's real questions, to examine whether and how parents spontaneously use analogy. Study 1 found that parents did use analogy spontaneously in their explanations to children's questions, despite no prompts nor mentions of analogy. But are these spontaneous analogies any good? Study 2 asked how the common explanation givers (teachers and parents) and explanation receivers (university students) perceived the goodness of analogical explanations. Teachers, parents, and university students alike gave higher satisfaction ratings to analogical explanations than to non-analogical ones. Notably, school teachers are the strictest raters, as they give low ratings overall, while college students are the most generous raters. In Study 3, six-year-olds, unlike their parents, did not rate analogical explanations higher than non-analogical ones. But this is because children were actually sensitive to the quality of analogical explanations—distinguishing between good and bad analogies—while they were not discriminative to the non-analogical explanations (all were highly rated). These results provide new evidence for spontaneous analogy generation and characterize how people (teachers, parents, university students, young children) perceive analogies, with potential implications for instructional settings.

Supporting Students' Mathematical and Analogical Thinking while Under Stress
Presenting Author: Lindsey Richland, University of California, Irvine, United States; **Co-Author:**Almaz Mesghina, Northwestern University, United States; **Co-Author:**Elayne Vollman, Lake Forest College, United States; **Co-Author:**Bella Lerner, University of California, Irvine, United States

Mathematics is a domain in which reasoning analogically about the relationships between problems, procedures, solution strategies, or concepts can help the learner generalize concepts and solve new problems. At the same time, learning through comparing and aligning representations is a cognitively complex endeavor, and requires high cognitive resource availability. In times of stress such as the Covid-19 pandemic, or when students experience high math anxiety, these resources may be already taxed with anxious ideation, which may mean students will have less available resources to conduct higher order thinking about the mathematics. To successfully learn from a comparison between mathematical representations, students must not only notice the relevance of the comparison, but also manipulate and compare a source analog (e.g. a worked example) to a target analog (e.g. transfer problem), evaluate a multi-step solution strategy and map the relevant sequence across the representations (see [Blinded], 2017). We report a series of studies that examined the strategic use of worked examples as visual-spatial cues, and the role of teacher language of higher order thinking (HOT) and to support the reasoning process. We find these are pedagogical practices that can increase the likelihood that children engage in successful higher order thinking during learning, protecting against the effects of math anxiety and situational stress on learning.

Session L 6

25 August 2023 08:00 - 09:30
UOM_CH
Symposium
Motivational, Social and Affective Processes

The phenomenon of school alienation under the magnifying glass

Keywords: At-risk Students, Emotion and Affect, Mixed-method Research, Motivation, Pandemic, Qualitative Methods, School Effectiveness, Secondary Education, Social Aspects of Learning and Teaching, Teaching/Instructional Strategies
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Julia Morinaj, University of Bern, Switzerland
Chairperson: Tina Hascher, Switzerland
Organiser: Julia Morinaj, University of Bern, Switzerland
Organiser: Tina Hascher, Switzerland
Discussant: Barbara Schober, University of Vienna, Austria

As students progress in grade level, they tend to lose intrinsic motivation and interest in learning and might become alienated from school. Following a recent conceptualization, s*chool alienation* is understood in terms of negative attitudes towards academic and social aspects of schooling that develop over time. Alienated adolescents display decreasing classroom participation, higher levels of perceived injustice, low well-being, declining achievement, school refusal, and higher drop-out rates. Repeated and accumulated negative experiences in school can affect students' educational trajectories and result in alienation from the whole education system.This symposium contributes to the conference theme 'Education as a hope in uncertain times' in providing a common perspective on and a deeper understanding of the phenomenon of school alienation. The first presentation examines the relationship between school alienation and student perception of teacher injustice among Swiss primary and secondary school students. The second presentation identifies factors associated with school

alienation during the transition from lower to upper secondary school in Austria. The third presentation centres on the development of school alienation in lower secondary school in Luxembourg. The fourth presentation explains the development of school refusal using school alienation theory and a systemic integrated cognitive approach. The four studies capture students' attitudes and emotions towards school from primary to upper secondary school and invite a discussion on how school alienation differs between educational systems. Understanding school alienation may contribute to an understanding of the vulnerability of students and knowledge about possibilities in preventing school alienation, especially during the times of uncertainty.

Teacher Justice Perception and School Alienation in Swiss Primary and Secondary Schools
Presenting Author: Julia Morinaj, University of Bern, Switzerland; **Presenting Author:**Angela Rebecca Aegerter, University of Bern, Switzerland; **Co-Author:**Tina Hascher, University of Bern, Institute of Educational Science, Switzerland

Student perception of teacher behavior can affect student motivation, well-being, and attitudes toward school. More specifically, student perception of teacher injustice can impede well-being and may be correlated with student alienation from school. The aim of the present longitudinal, mixed-method study was to examine the development of student perception of teacher injustice and its association with school alienation. First, questionnaires were administered to n = 564 primary school students during grade 4 to 6 and n = 610 secondary school students during grade 7 to 9. Second,n = 69 sixth graders and n = 65 seventh graders participated in group discussions about subjective causes and experiences of school alienation. Cross-lagged modeling was applied to examine the correlations between teacher injustice perception and three school alienation domains (alienation from learning, from teachers, from peers) at each of the three time points, the temporal stability of teacher injustice perception and school alienation domains, and their cross-lagged effects across time. Results showed that the pattern of relationship varies across school alienation domains and the educational stage, pointing to the complex interplay between student perception of teacher injustice and their alienation from school. Findings from the qualitative analyses of the group discussions indicated that teacher injustice is perceived as related to violations of the principle of equal treatment of all students. This concerns mainly classroom management, assessment, disciplinary measures, and the quality and quantity of learning opportunities. The findings highlight the importance of just and supportive teachers in preventing students' alienation from school.

The risk of school alienation after transition to upper secondary school in Austria
Presenting Author: Claudia Schreiner, University of Innsbruck, Austria; **Co-Author:**Fred Berger, University of Innsbruck, Department of Education, Austria; **Co-Author:**Livia Jesacher-Rössler, Friedrich-Alexander-University Erlangen-Nürnberg, Germany; **Co-Author:**Christian Kraler, Teacher Education and School Research, Austria; **Co-Author:**Wolfgang Hagleitner, University of Innsbruck, Department of Education, Austria; **Co-Author:**Susanne Roßnagl, University of Innsbruck, Department of Education, Austria

School alienation is a risk factor for unsuccessful school careers. Teachers and the shaping of learning processes play a pivotal role in avoiding developments toward such alienation processes. This presentation focuses on the discussion of alienation taking especially into account two perspectives: the transition to upper secondary education, a general phase of uncertainty, and the situation created by the COVID-19 pandemic. The latter can be seen as a looking glass for existing challenges. Regression models based on data from a longitudinal study (t1: Grade 8; t2: Grade 9; N = 144 students) were used to identify factors associated with alienation from learning and from teachers. In addition to structural and sociodemographic variables, measures on students' personal resources, school-related factors, and effects of the pandemic were included. The results point to teachers' diagnostic expertise regarding achievement and social integration in class as support factors to reduce the risk of alienation. Alienation from learning is higher in school tracks which lead to a lower level of formal qualification. Alienation from teachers is associated with lower parental formal education. While coping with the demands of the pandemic is related with alienation from teachers, there are no effects on alienation from learning. Regarding students' personal resources, only learning motivation had an effect on alienation from learning. The analyses show that students with certain tracks to upper secondary education have higher tendencies for alienation, particularly alienation from learning. For teachers, their level of diagnostic expertise regarding achievement contributes to reducing the risk of school alienation.

Conditions for and expressions of alienation from learning in secondary school
Presenting Author: Alyssa Laureen Grecu, Center for Research on Education and School Development, Germany

Alienation from learning determines students' educational trajectories and life course and is associated with educational inequalities. This contribution examines the conditions of the development of alienation from learning and its expressions in lower secondary school using Luxembourg as an example. Using a qualitative approach, five cases of affected students from high and low-achieving school tracks (seventh graders) are analyzed based on interviews and group discussions. As alienation from learning is closely related with a lack of fit between students' individual dispositions and the specific school culture (Helsper, 2008; Kramer & Helsper, 2011), differences between school tracks considering causes and the handling of alienation from learning are identified. Results indicate that alienation from learning is relevant in both academic and low-achieving school tracks, but the specific school cultures constitute different risks for developing alienation from learning. Common expressions in both school tracks comprise both passive and oppositional behaviors. Aspects that enhance alienation from learning in the academic school track are highly theoretical learning content, students' perceptions of likelihood realizing educational promises, overstrain and pressure to perform. In contrast in the preparatory track, aspects that enhance alienation from learning comprise underchallenge, rejection by teachers and disruptive behaviors of classmates.

CANCELLED: Applying school alienation theory and (...)
Presenting Author: Trude Havik, University of Stavanger, Norway

This paper has been cancelled and will not be presented at the EARLI conference.
Attending school is seen as a precondition for youths' academic, social, and emotional learning. However, school absenteeism is a problem in many countries (e.g., Gren-Landell et al., 2015; Heyne et al., 2019a, 2019b). Moreover, there are different types of absences and a myriad of risk- and maintaining factors. One type is school refusal, which is absence related to strong negative emotions while at school or prior to school. The aim of this presentation is to explain how school refusal might emerge and develop, by using two theoretical perspectives: the school alienation theory and a systemic integrated cognitive approach. By using these two theories, identification and interventions might be targeted at an early stage of the development process of school refusal.

Session L 7

25 August 2023 08:00 - 09:30
AUTH_T002
Symposium

Understanding and combatting gender differences in student motivational factors in STEM

Keywords: Achievement, Gender Issues, Gifted and Talented Students, Informal Learning, Interest, Mathematics/Numeracy, Meta-analysis, Motivation, Science and STEM
Interest group:
Chairperson: Kaley Lesperance, Technical University of Munich, Germany
Organiser: Kaley Lesperance, Technical University of Munich, Germany
Discussant: Christian Thurn, ETH Zurich, Switzerland

Gender differences in educational contexts are often most prominent in student motivational outcomes, such as interest, self-efficacy, or value beliefs. This can clearly be seen in STEM subjects. In subjects such as science, mathematics and technology, female students in primary and secondary school consistently display lower levels of motivational outcomes than males, even when their performance is almost equal. This is problematic, as these outcomes impact later academic and career choices, which partly explains why many countries have less women in STEM careers than men. This symposium examines two aspects of motivational-affective gender differences in STEM: (1) are there differences in the gender gap across subjects and countries and (2) what can be done to combat them? The first two studies address the development and manifestation of these differences: Study 1 examines gender differences in the development

of students' motivational profiles in math, science and language between 5th and 6th grade, whereas Study 2 uses meta-analytic techniques to examine gender differences in math and science motivation of gifted adolescent students. The final two studies explore potential ideas to combat these differences: Study 3 examines whether teacher support has an effect on gender differences in interest, self-concept and self-efficacy in secondary school mathematics, whereas Study 4 evaluates whether exposure to females working in STEM careers could help reduce gender differences in children's interest and stereotypes in engineering and technology. The multi-facetted nature of this symposium will allow participants to generate valuable discussion relevant to both educational researchers and practitioners alike.

Gender difference in motivation profiles, achievement and STEM aspiration of primary school students
Presenting Author: Kezia Olive, University of Helsinki, Finland; **Co-Author:**Xin Tang, University of Helsinki, Finland; **Co-Author:**Anni Loukomies, University of Helsinki, Finland; **Co-Author:**Kalle Juuti, University of Helsinki, Finland; **Co-Author:**Katariina Salmela-Aro, Helsinki University, Finland

To better understand the development of gender gap in science, technology, engineering and math (STEM) aspiration, we examine domain-specific motivation (i.e., task values and self-concept of ability) of 5th and 6th year students in Helsinki, Finland (~11-12-year-old, *n*= 360, 55% girls). We aimed to (1) derive students' motivational belief profiles regarding *science, mathematics*, and *language* (Finnish), (2) analyze the stability and change in their profiles between 5th and 6th grades, (3) assess the relationship between motivational profiles, achievement and STEM aspiration, and (4) test for gender differences. Four motivational profiles were derived for both years: *high motivation in all subjects* (~21%), *high mathematics motivation* (~46%), *low mathematics motivation* (~11%), and *low motivation in all subjects* (~8%), with most students remaining in the same profile throughout the 2 years. We found evidence for gendered differences in the profile membership and the chance of transitioning between profiles: more girls were characterized by low math motivation, and boys were more likely to transition to higher math motivation in 6th grade. These motivational differences were reflected in their achievement, although not strongly coupled with their STEM aspiration. The findings suggest that at this developmental stage, Finnish students have started developing (gendered) domain-specific motivation which has influenced their achievement but was not associated strongly with their STEM aspiration. These findings offer insights into different risks and opportunities in terms of STEM-related pathways for girls and boys at the end of their elementary school years.

Mathematically talented female and male students: Equally motivated in math and science?
Presenting Author: Lena Keller, University of Potsdam, Germany; **Co-Author:**Franzis Preckel, University of Trier, Germany; **Co-Author:**Jacquelynne S. Eccles, University of California Irvine, United States; **Co-Author:**Martin Brunner, University of Potsdam, Germany

The present study examined gender differences in achievement motivation in math and science among 113,864 top-performing adolescent math students (top 5% in their respective countries). To do this, we conducted an individual participant data (IPD) meta-analysis using data from six cycles of the Programme for International Student Assessment (PISA 2000–2015; 82 countries, 15-year-old students). We found that in the group of top-performing math students, male students were overrepresented (mean female-to-male ratio 1:1.50). Male students had stronger math self-efficacy (d = 0.32) and higher intentions to focus on math (d = 0.27) than female students did. Furthermore, male students reported higher instrumental math motivation (d = 0.16), higher math self-concept (d = 0.15), and greater interest in math (d = 0.10). Female students reported higher self-responsibility for failure in mathematics (d = –0.13), higher math anxiety (d = –0.15), and a higher math work ethic (d = –0.16). Moreover, female students were more interested in organic and medical fields ($0.44 \leq d \leq -0.30$), whereas male students showed greater interest in physics-related topics ($0.39 \leq d \leq 0.54$). Gender equality indicators moderated the proportion of female students in the top 5% in mathematics, but not gender differences in math and science motivation in this group. Results are explained by social role theory and situated expectancy–value theory, and implications for women's underrepresentation in (specific) STEM fields are discussed.

Does teacher support lessen gender differences in motivational outcomes in mathematics?
Presenting Author: Kaley Lesperance, Technical University of Munich, Germany; **Co-Author:**Jasmin Decristan, University of Wuppertal; IDeA-Research Center, Germany; **Co-Author:**Doris Holzberger, Technical University of Munich (TUM) & ZIB (Centre for International Student Assessment), Germany

Male and female students tend to differ in mathematics in regards to their motivational outcomes, such as self-concept, self-efficacy and interest, with female students often displaying lower levels of these outcomes, especially in secondary school. To understand and lessen these gaps, it is crucial to evaluate what aspects of students' classroom experiences might be involved. Many aspects of instructional quality have strong effects on various student motivational outcomes. Particularly teacher constructive support has been shown to be strongly linked to student motivational factors. As such, teacher constructive support may have also the potential to reduce gender gaps in motivational outcomes. The goal of this study is to investigate whether teacher constructive support could play a moderating role between gender and student motivational outcomes. Using the student questionnaire data from the Teaching and Learning International Survey (TALIS) Germany 2018 Video Study (n = 1,140 students), we used latent moderated structural equation models to evaluate whether student perceptions of teacher constructive support moderated the effect of student gender on self-concept, self-efficacy and interest in mathematics. Preliminary analyses revealed that female students had lower levels of both self-concept and self-efficacy, and teacher constructive support had significant positive effects on all three motivational outcomes for both genders. However, teacher constructive support did not moderate the relationship between student gender and motivational outcomes. These findings contribute to research aiming to reduce the gender gap in mathematics.

Promoting children's interests and ability beliefs in engineering and technology at a science museum
Presenting Author: Fidelia Law, University of Exeter, United Kingdom; **Co-Author:**Luke McGuire, University of Exeter, United Kingdom; **Co-Author:**Manuela Baretto, University of Exeter, United Kingdom; **Co-Author:**Adam Rutland, University of Exeter, United Kingdom

Women's underrepresentation in technology and engineering has been linked to gender stereotypes and interests in these fields. One way to remedy this may be to promote girls' interest and challenge gender stereotypes in STEM from an early age (Shapiro & Williams, 2012). This pre-registered study demonstrated how sharing real-life stories of local STEM workers with children visiting a science museum is related to children's interests and gender stereotypes in STEM. Participants were 230 children (49.5% girls) who either 1) heard the stories and saw pictures of local people working in STEM, 2) heard the same stories and heard a growth mindset message, or 3) did not hear the stories or growth mindsets (controls). After visiting the exhibit, children responded to a survey measuring their interest and gender stereotypes in engineering and technology. Overall, the results demonstrated that younger children showed more interest in technology and engineering than older children. Further, girls in the control group showed lesser interest in engineering than boys, but no difference was observed between boys and girls who heard the STEM stories and the growth mindset message. Further, results also show that after hearing the STEM stories, children showed less gender stereotypes (more equitable ability beliefs) in technology and engineering than the control group. This indicates that the stories of STEM workers cultivated an interest in girls towards engineering, and promoted equitable beliefs in girls' and boys' ability to do well. This has important implications for practice and interventions designed to increase STEM interest among children.

Session L 8

25 August 2023 08:00 - 09:30
UOM_A02
Symposium
Assessment and Evaluation, Teaching and Teacher Education

Assessing scientific reasoning and argumentation skills across disciplines

Keywords: Argumentation, Assessment Methods, Classroom Assessment, Higher Education, Pre-service Teachers, Reasoning, Secondary Education, Simulation-based Learning, Social Sciences and Humanities
Interest group: SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Marleen Evers, KU LEUVEN, Belgium
Organiser: Marleen Evers, KU LEUVEN, Belgium
Discussant: Javier Fernández, Universidad de Leon, Spain

Scientific reasoning and argumentation (SRA) are complex thinking skills and are defined as “the ability to understand and apply scientific concepts, methods and findings appropriately when solving problems in scientific research, professional practice and daily life” (Hetmanek et al., 2018, p. 203). In addition to be an important goal in itself, attention for SRA in education also contributes to other learning goals, such as a profound understanding of a specific scientific discipline (Klahr et al., 2019), and epistemological learning gains (Chinn et al., 2011). In line with other complex thinking skills assessing SRA is challenging (van Merriënboer & Kirschner, 2018). Not only because it concerns complex thinking skills but also diverse epistemic practices and criteria in different scientific disciplines. However, assessing SRA has only recently been a focus of research. In this symposium challenges to assess SRA will be discussed from different perspectives (disciplines: psychology, medicine, education, mathematics; educational levels: secondary education, teacher education; purpose: assessing SRA, assessment as SRA) together with its educational implications. The SRA framework of Fischer and colleagues (2014) provides the overall structure to integrate all contributions. This framework facilitates interdisciplinary research on SRA by integrating existing conceptualizations of SRA from different research strands. SRA is hereby considered a multidimensional construct consisting of various activities: problem identification, questioning, hypothesis generation, construction and redesign of artifacts, evidence generation, evidence evaluation, drawing conclusions, and communicating and scrutinizing. In the different symposium contributions the assessment of at least one SRA activity, and often multiple activities are included.

Impact of teacher’s epistemological beliefs on assessing scientific reasoning tasks in psychology
Presenting Author: Marleen Evers, KU LEUVEN, Belgium; **Co-Author:**Jan Elen, KU Leuven, Belgium; **Co-Author:**Machteld Vandecandelaere, KU Leuven, Belgium

Scientific Reasoning and Argumentation (SRA) can be defined as the ability to understand and appropriately use scientific concepts, methods, and findings when solving or explaining problems in a specific discipline (Fischer et al., 2014). SRA are recognized to be important 21st century skills and their acquisition is among the intended goals of general secondary education around the world. Intensive focus group interviews from a previous study with secondary psychology teachers suggest an impact of teachers’ epistemological beliefs on the determination of assessment criteria, and the actual use of these criteria to assess students’ SRA. Therefore, this study investigates the impact of teachers’ epistemological beliefs on the determination and use of criteria to assess SRA in psychology, a non-paradigmatic and ill-structured domain. In a first phase, teachers receive different written products of students’ SRA and are asked to construct assessment criteria for each product. In a second phase, teachers are asked to actually carry out the assessment by using assessment criteria predefined by the researchers. All learning products reflect students’ SRA as conceptualized by Fischer and colleagues (2014) with focus on ‘Evidence evaluation’ and ‘Drawing conclusions’. Products further relate to the same psychological topic but differ in complexity and quality of student answer. Teachers’ epistemological beliefs are measured by two discipline-focused instruments: DEBQ (Hofer, 2000) and ETA (Barzilei & Weinstock, 2015). Results reveal that the assessment of SRA benefits from more mature and adapted epistemological beliefs, and can therefore be considered functional for the assessment of SRA in psychology education.

Assessing scientific reasoning skills and research competences in teaching-related fields of studies
Presenting Author: Anna Horrer, Institute of Medical Education, LMU Klinikum, Ludwig-Maximilians University Munich, Germany; **Co-Author:**Tolgonai Erkinova, Department of Psychology, LMU Munich, Germany; **Co-Author:**Insa Reichow, Educational Technology Lab, German Research Center for Artificial Intelligence, Berlin, Germany; **Co-Author:**Michael Sailer, LMU Munich, Germany; **Co-Author:**Maximilian Sailer, University of Passau, Germany; **Co-Author:**Moritz Heene, Department of Psychology, LMU Munich, Germany; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands; **Co-Author:**Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Martin Fischer, LMU University Hospital, Institute of Medical Education, Germany; **Co-Author:**Jan Zottmann, Institue of Medical Education, University Hospital, LMU Munich, Germany

Reading and evaluating the quality of scientific texts are daily activities of students and scientists and central for evidence-based decision-making, which comprises *using evidence*. This, in turn, requires scientific reasoning skills and*establishing evidence* that requires research competences. Two crucial scientific reasoning skills, namely *evidence evaluation* and *drawing conclusions*, are essential for decision-making in scientific research, professional practice, and daily life. Research competences include declarative and procedural knowledge of research methods, methodology, and procedures. We assume that students’ scientific reasoning skills as well as their research competences are necessary for evidence-based decision-making and related to students’ empirical research practice within their study program. Empirical research practice reflects the extent of students’ self-experienced empirical research practice during a study program. To operationalize empirical research practice, we compared students from three study programs within the domain of education that differ in the number of ECTS credits allocated to empirical research practice (i.e., n=102 teacher students, n=57 educational sciences students, and n=48 psychology of learning sciences students). MANOVAs revealed that students with higher exposure to empirical research practice outperformed students with medium or low exposure to empirical research practice in evidence evaluation and research competences. However, we found no differences regarding the scientific reasoning skill drawing conclusions. The results of our study imply that empirical research practice fosters evidence evaluation, but students apparently have difficulty applying their skills to come to evidence-based decisions. We conclude that scientific reasoning skills are not tacitly acquired by attending university – instead, they need to be taught explicitly.

Assessing students’ causal historical reasoning ability with the use of writing tasks
Presenting Author: Gerhard Stoel, Radboud University, Nijmegen, Netherlands; **Co-Author:**J.P. van Drie, University of Amsterdam, Netherlands

In history education, students’ ability for scientific reasoning and argumentation (SRA) is often evaluated through writing, based on the analysis of multiple sources. However, scholars have raised questions about the extent to which students are able to show their historical reasoning ability within the context of a historical writing task. These scholars emphasized that writing historical texts is complex because it involves integrating substantive knowledge, knowledge of second-order concepts, epistemological understanding, together with knowledge of historical text structures and a specialized vocabulary. In the current study, we triangulate outcomes from two studies in which we analyzed how 11^{th}-grade pre-university students’ revised their essays about the causes of German involvement in the First World War, after a lesson unit that focused on fostering students’ causal historical reasoning. In the first study we used a scoring rubric and in the second we analyzed students’ revisions qualitatively. Results from the qualitative analysis show that students’ causal writing developed on multiple aspects (i.e. the amount of claims), but students’ initial text structure interacted with the type of revisions students made. Analysis with a scoring rubric failed to capture this development. Our results raise questions about the validity of writing tasks and rubrics to analyze causal historical reasoning.

Measuring assessment skills in simulations: Influence of pre-service teacher characteristics
Presenting Author: Michael Nickl, Technical University of Munich (TUM), Germany; **Co-Author:**Daniel Sommerhoff, Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Elias Codreanu, Technische Universität München, Germany; **Co-Author:**Stefan Ufer, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany

Assessing students’ characteristics requires various scientific reasoning and argumentation skills, such as generating evidence, evaluating evidence and drawing conclusions. As novice teachers oftentimes perceive the assessment of students’ characteristics as challenging, teacher educators strive for appropriate learning environments targeting these skills. In that regard, simulations are effective environments for measuring and learning assessment skills in university-based teacher education. Whereas cognitive and motivational-affective learner characteristics influence teacher judgments in text-based tests, their role in authentic practice representations such as simulations is rather unclear. Therefore, we conducted a study with N = 150 pre-service teachers using an empirically tested video-based simulation for promoting teacher assessment skills. We investigated the role of pre-service teachers’ cognitive and motivational-affective characteristics in the simulation by identifying profiles of these characteristics and relating them to the achieved outcomes of assessment skills. In data analysis, three profiles were identified: a knowledgeable profile, a motivated profile, and a profile with below average knowledge and motivation. Regarding the assessment process and judgment accuracy, the knowledgeable tends to outperform both other profiles. These results substantiate the important role of cognitive learner characteristics for scientific reasoning and argumentation skills. Also, the results underpin that depending on their learner characteristics, pre-service teachers navigate differently through the simulation, as for example, the knowledgeable profile used most time for the assessment process, which may have led to a higher assessment accuracy. This highlights that, by optimizing the profiles’ navigation through the simulation, adaptive support may be promising to further increase learning gains.

Session L 9

25 August 2023 08:00 - 09:30
UOM_A03
Symposium
Learning and Social Interaction

The Social Nature of Education: A Closer Look at Peer Networks of Students and Teachers

Keywords: Anxiety and Stress, E-learning/ Online Learning, Higher Education, Learning Analytics, Peer Interaction, Quantitative Methods, Secondary Education, Social Aspects of Learning and Teaching, Social Interaction, Teacher Professional Development
Interest group: SIG 17 - Methods in Learning Research
Chairperson: Julia Eberle, Ruhr-Universität Bochum, Germany
Discussant: Julia Eberle, Ruhr-Universität Bochum, Germany

Social distancing as a countermeasure against the COVID-19 pandemic had a tremendous impact on education worldwide. The lack of co-located peer interaction among students and among teachers, due to the move to emergency online teaching, showed that the importance of social relations in education has been drastically underestimated in the past. More research dedicated to peer interaction and collaboration in the educational system is urgently needed. The scarcity of such research can to some extent be explained by the complex nature of relational data that inherently violates core assumptions of traditional statistical methods used in educational research. In this symposium, the contributions share a methodological focus on advances to overcome this methodological problem by bringing together social network analysis with traditional statistical methods.The four studies in this symposium explore peer networks among key stakeholders in the educational systems and investigate how such peer networks are related to core aspects of learning. The first set of papers focusses on student interaction, exploring how the design of online courses shapes the interaction among students and how social interaction as a resource for students' emotional coping with stress evolves over time. The second set of papers sets a focus on teachers, investigating the social nature of teachers' professional development. These papers look at how teachers collaborate, differentiating specific collaborative activities within different groups of teachers' social networks and focusing on the social structure and effective positioning of teachers within school networks.

Examining Academic Diversity in Online Peer Interactions at Scale
Presenting Author: Oleksandra Poquet, TUM, Germany; **Co-Author:**Shane Dawson, University of South Austrialia, Australia; **Co-Author:**Vitomir Kovanovic, University of South Australia, Australia; **Co-Author:**Christopher Brooks, University of Michigan, United States

Studies of university online discussions show that students who have the same level of academic performance end up interacting with one another online. This network-based phenomenon is known as grade-based homophily and signals academic diversity in course discussions. The reasons for this observed grade-based homophily remain inconclusive. Prior work had ruled out social processes and student time management habits as potential reasons for this observed homophily between the students. To further examine potential causes, this study analysed student interaction data from 697 online university courses. We found that the distribution of grade point average (GPA), that describes the student cohort posting into online discussions, can explain over 40% of variance in the grade-based homophily that emerges within the course discussions. This distribution differs from the GPA distribution of all the students enrolled in a course. Different properties of online course discussions were also examined. Academic diversity in online discussions was present in courses where discussions combined participation and interaction activities. That is, lower grade-based homophily was observed in courses that both encouraged students to make independent contributions and to build on peer posts.

The role of social capital in secondary school teachers' work socialization process
Presenting Author: Thibault Coppe, University of Groningen, Netherlands; **Co-Author:**Jasperina Brouwer, University of Groningen, Netherlands; **Co-Author:**Laura Thomas, Ghent University, Belgium

Research on teachers' professional development has emphasized the importance of professional interactions for teachers' development (Baker-Doyle & Yoon, 2020). Despite the increased attention to the social nature of teachers' professional development, research focusing on teachers' social position within the school network as a resource for this process is scarce. In the current study, we delved into this relatively unexplored area of research by building on the concept of social capital (Lin, 2008). In particular, (1) we pursued a thorough investigation of the role of social capital in secondary school teachers' professional development, and (2) in the process worked on an innovative method for combining traditional linear statistical models with social network analysis. The latter is related to the challenge of violating the assumption of independence of observations when exploring relational phenomena, preventing researchers from using traditional linear models to explore social network data (Tranmer et al., 2014). Recent developments inspired by the multiple membership model offer a promising avenue for progress in this area (Coppe et al., 2022). The current study built on this progress even further by bringing more advanced statistical routines (i.e., SEM) into the equation. In attaining the two aforementioned objectives, a sample of three whole school social networks was used. Preliminary analyses showed that social capital strongly predicts teachers' development but with differential effects related to different measures of social positioning. Specifically, degree centrality showed the highest prediction coefficient, followed by closeness centrality. We did not find any significant relationship between betweenness centrality and teachers' development.

How is the occurrence of collaborative activities related to teachers' collaborative attitudes?
Presenting Author: Julie Droissart, Ghent University, Belgium; **Co-Author:**Melissa Tuytens, Ghent University, Belgium

To meet society's increasing educational expectations and the needs of a more diverse student population, teacher collaboration in higher education can strengthen individual teachers (Newell & Bain, 2018). Deep-level collaboration (including exchange activities, professional collaboration, and constructive conflict) needs to be stimulated for realizing actual institutional improvement and teacher learning (Plauborg, 2009). Little is known about which collaboration activities occur within the higher education context, just like the advantages of working with different colleagues (i.e. direct colleagues, colleagues from their institution, and external partners) are underexplored (Gast et al., 2017). Furthermore, collaborative attitudes deserve adequate attention. Therefore, this study captures collaborative activities among higher education teachers in Flanders and discovers how their occurrence is related to teachers' collaborative attitudes via an online survey. Results show that lecturers mainly report exchange activities with direct colleagues. Exchange activities with other colleagues and external partners are reported less. Professional collaboration seems to be implemented infrequently. Constructive conflict, in turn, is most often played out with direct colleagues. In addition, university college teachers report significantly more exchange activities and constructive conflict with direct colleagues than university teachers. Also, university college teachers report significantly more professional collaborations with external partners. Finally, teachers' collaborative attitudes appear to be a significant predictor for performing exchange activities and constructive conflict with direct colleagues.

The relationship between stress and perceived social support among university students
Presenting Author: Jasperina Brouwer, University of Groningen, Netherlands; **Co-Author:**Jannika Haase, Leibniz University Hannover, Germany; **Co-Author:**Lysann Zander, Leibniz University Hannover, Germany

Peer networks can crucially affect students' experiences in new academic environments. Yet, social networks of students can be highly differentiated. Empirical studies examining how different types of support relate to students' perceived stress in the higher education context remain scarce (for examples see Brouwer et al., 2016; Etcheverry et al., 2001). The present study examines the role of three types of peer support networks (academic and personal support networks, friendship) as they relate to students' stress experiences during the first semester. Students differ in their access to different forms of social capital (Lin, 1999), which may impact their stress experiences. Simultaneously, individual experiences of stress levels may impact the access and mobilization of different forms of peer support. The present research seeks to clarify whether higher levels of stress experiences relate to lower access to peer support networks or, the opposite, higher access to peer support networks. Analyzing the sociometric data of 196 students, we examined the association between stress and students' centrality in these three types of networks. In preliminary descriptive found that student's outdegree in the academic support network was negatively associated with stress 10 weeks later.to elicit peer support at the end of the term. Additionally, we found positive associations between the three types of support networks. To

disentangle social selection from social influence, we will estimate stochastic actor-based models (SAOM) in RSiena to investigate the co-evolution of different forms of support networks and stress (e.g., Snijders, 2001).

Session L 10

25 August 2023 08:00 - 09:30
AUTH_TE2
Symposium
Assessment and Evaluation

Teachers' assessments and students' educational success – insights into a complex relation

Keywords: Achievement, Assessment Methods, At-risk Students, Classroom Assessment, Educational Attainment, Meta-analysis, Motivation, Primary Education, Reading, Secondary Education, Special Education, Synergies between Learning / Teaching and Research, Teacher Effectiveness, Teacher Professional Development
Interest group: SIG 01 - Assessment and Evaluation
Chairperson: Katharina Molitor, Germany
Organiser: Katharina Molitor, Germany
Organiser: Justine Stang-Rabrig, TU Dortmund University, Germany
Organiser: Nele McElvany, TU Dortmund University, Germany
Discussant: Christine M Davies, University of Auckland, New Zealand

Students are assessed in regard to their competencies, behaviour, and participation in class by teachers regularly in their everyday school live. False assessments might lead to maladaptive teaching, unjust grades and wrong decisions, and hence hinder students tapping their full potential. Consequently, teachers' assessments are crucial for students' further life course. This symposium connects here and provides insights into the complex relation between teachers' assessments and students' educational success.
The first presentation investigated the question whether the relation between teachers' judgment accuracy and student achievement is mediated by teaching quality. The second presentation asked if teachers' accuracy of the perception of students' reading fluency can be improved by implementing Reciprocal Teaching for students with and without learning difficulties. The third presentation focuses conditions for success for incorrect teacher assessment on educational paths and examined whether student motivation is relevant in this context. The fourth presentation asked on a meta-analytic level how teachers' assessment accuracy can be improved. The session will be concluded by a discussion from a renowned researcher who will point out strengths, difficulties and further research questions regarding this important topic.
The symposium provides a comprehensive view on this complex relation. It does not only provide information on the state of research but also provides starting points to improve teacher assessment accuracy.

Teachers' judgment accuracy: how is it related to teaching quality and student achievement?
Presenting Author: Dimitra Kolovou, St. Gallen University of Teacher Education (PHSG), Switzerland; **Co-Author:**Jan Hochweber, St. Gallen University of Teacher Education, Switzerland; **Co-Author:**Anna-Katharina Praetorius, University of Zurich, Switzerland

Teachers' judgment accuracy is considered important for high quality teaching and student achievement development. However, there is little empirical evidence regarding this assumption. We therefore examined effects of teachers' accuracy, measured both at student and class/teacher level, on student achievement over a period of three school years and whether these effects were mediated by four teaching quality aspects (individual support, cognitive activation, comprehensibility and clarity, and consolidation) via different pathways (i.e., cross-and unique cluster level mediation and student level mediation). Data from 35 German language teachers (N = 646 students) and their students in German-speaking Switzerland were analyzed using multilevel regression models with small sample correction methods. The results showed that teachers' judgment accuracy at class/teacher level did not predict achievement at the end of 9th grade. However, accurately judged students had higher achievement in German language than underestimated students after three years of teaching by the same teacher. None of the teaching quality aspects mediated the effect of teaching quality. Taken together, these findings do not provide conclusive information about how TJA relates to student achievement. However, they suggest that conceptually different accuracy measures may differ in their predictive power. Finally, the results call for more research, especially in studying effects over different time intervals.

Accuracy of teachers` perceptions on students` reading fluency.
Presenting Author: Maris Juhkam, Tallinn University, Estonia; **Co-Author:**Mikko Aro, University of Jyväskylä, Finland; **Co-Author:**Piret Soodla, Tallin University, Estonia

The aim of the study was to examine the accuracy of Estonian teachers' and support specialists' perceptions of students' reading fluency and to investigate whether and to what extent the implementation of a Reciprocal Teaching (RT), that involved regular monitoring of students' skills, improves the accuracy of teachers' opinions. The sample included 184 third grade students, 34 of whom were students with learning difficulties (LD), 11 classroom teachers and eight support specialists. Teachers assessed reading fluency of all students, support specialists assessed only skills of students with LD. After the RT intervention, seven classroom teachers' thoughts of 114 students' reading fluency were recollected and analyzed. The perceptions were collected using scales, and students' reading fluency were assessed using individual tests. We found that before the RT intervention, the sensitivity of the teachers' was 62% and the specificity was 87%. Comparing the accuracy of teachers' and support specialists' on reading fluency of students with LD, it appeared that the teachers' were somewhat more accurate. We found that after the RT intervention, the sensitivity of the teachers' increased, while the specificity remained the same. The results suggest that teachers as well as support specialists need support in assessing students' reading fluency, and conducting an RT intervention, with systematic monitoring of students' skills, can guide teachers to more accurately assess students' reading fluency.

Attending the academic track without teacher recommendation – predictors of educational attainment
Presenting Author: Katharina Molitor, Center for Research on Education and School Development, TU Dortmund University, Germany; **Co-Author:**Justine Stang-Rabrig, TU Dortmund University, Germany; **Co-Author:**Paul Fabian, CENTER FOR RESEARCH ON EDUCATION AND SCHOOL DEVELOPMENT, Germany; **Co-Author:**Nele McElvany, TU Dortmund University, Germany

Students' educational pathways largely depend on the transition decision at the end of elementary school. In Germany, this decision is mostly based on teachers' enrollment recommendation, which is known to be socially biased. However, there is evidence that students without an academic-track enrollment recommendation (ATER) can be successful on academic-track schools. It is known that students' motivation can buffer against educational inequalities and that students without ATER can be successful on higher school types, but few results exist on the conditions for success for those students. We aimed to close this gap by using longitudinal data from the German National Educational Panel Study starting cohort Grade 5 (SC3) (N = 2,671 students; M = 10.4 years, SD = 0.85, 48.2% female). Descriptively, we compared group means for academic-track students with and without ATER concerning their family background (e.g. parental education, immigrant background) and motivational factors (e.g., expectation of success, value of education and learning stress). Group-comparing structural equation models revealed that parental education predicted obtaining *Abitur* only for students without ATER when considering motivational factors, but not for students with ATER. In both groups motivation promoted educational attainment. For students without ATER, expectation of success and value of education were particularly relevant. However, expectation of success and learning stress were more relevant for students with ATER. Nevertheless, not buffering effect for students without ATER was found. A further understanding of the mechanisms that helps prevailing against incorrect teacher assessments is needed, so students without ATER can tap their full potential.

Lens model studies: Revealing teachers' judgments for teacher education
Presenting Author: Esther Kaufmann, University of Konstanz, Switzerland

Teachers need to judge students accurately to ensure social justice within classrooms. Inaccurate judgments can result in conditions that prevent students from

reaching their full potential and can increase inequality between students' rates of learning and development. Currently, many reviews have estimated how accurately teachers overall judge students, but only a few provided clues about how teachers' accuracy could be improved. To provide insight regarding the sources of teachers' (in)accuracy, we review and synthesize lens model studies concerning the judgment accuracy of teachers. By the lens model equation, the complex relationship between teachers' assessment and students' educational success is break-down into different components (e.g., teacher, environment, and interaction of it) to reveal sources of teachers' inaccuracy. After describing the lens model and the limitations of previous reviews, an individual participant data meta-analysis of lens model studies was performed and compared with non-lens model studies on teachers' judgment accuracy. Finally, we describe how our approach can be utilized to enhance the accuracy of teachers' judgments by distinguishing sources of inaccuracy, particularly among teachers in need of further training, and judgment tasks that need the attention of subject matter experts.

Session L 11

25 August 2023 08:00 - 09:30
AUTH_T102
Symposium

Complex dynamical Systems in Educational Research: Diverse Conceptual and Empirical Applications

Keywords: Assessment Methods, Qualitative Methods, Quantitative Methods, Researcher Education
Interest group:
Chairperson: Dimitrios Stamovlasis, Aristotle University of Thessaloniki, Greece
Organiser: Dimitrios Stamovlasis, Aristotle University of Thessaloniki, Greece
Organiser: Avi Kaplan, Temple University, United States
Organiser: Matthijs Koopmans, United States
Discussant: Eleftheria Gonida, Aristotle University of Thessaloniki, Greece

Life in the 21st century poses great challenges to education and educational research. Rapid technological changes that transform day-to-day life and work, climate change that threatens living conditions, health risks that quickly develop into global pandemics, and great inequality in the impact of these changes on different communities reflect the increasing complexity, unpredictability, and continuous change of environments and of people's lived experiences. EARLI 2023's theme "Education as Hope in Uncertain Times" charges educational research with informing educational policy and practice about preparing people for success in such uncertain times. Yet, arguably, many current educational theories, and much of the published educational research, describe learning, motivation, and achievement in predictable educational environments and traditional academic tasks. Theories and research that conceptualize and investigate educational phenomena as linear, predictable, and a-contextual may be inadequate for describing the competencies required for adaptive life under uncertainty, and for guiding educational practice to promote these competencies' development in diverse contexts. The current symposium begins to address this challenge by applying the complexity paradigm to educational phenomena. The Complex Dynamical Systems (CDS) perspective offers ontological and epistemological assumptions for theorizing and investigating learning, motivation, achievement, social interactions, and educational environments as inherently complex, dynamic, and not fully predictable. The four symposium's papers include conceptual and empirical examples of applying CDS to learning, motivation, and to grappling with persisting conundrums in educational research regarding causality and nonlinearity in educational phenomena.

A Complexity Perspective on Researching Causality in Educational Phenomena
Presenting Author: Stephen Whitney, University of Missouri/Columbia, United States; **Co-Author:**Avi Kaplan, Temple University, United States; **Co-Author:**Joanna Garner, Old Dominion University, Norfolk, United States

Understanding causal mechanisms is central to the design and implementation of successful educational environments and interventions. Yet, educational research is challenged in delineating causal processes in complex educational phenomena that are contextualized, involve multiple factors, evolve over time, and harbor inherent unpredictability. Particularly in light of the increasing uncertainty of life in the 21st century, current approaches to causal inference in educational research may be inadequate to inform educational policy and practice that strives to support administrators', educators', and students' learning, motivation, and achievement in the complex and uncertain environments within which they live and work. In this paper, we review the current state of casual inference approaches from a complex dynamic systems perspective. We compare non-complex and complexity-informed assumptions and practices for causal inference, interrogate outstanding challenges for causal inference in the complex dynamic systems approach and propose methodological implications for educational research that aims to derive causal inferences and recommendations for policy and practice that are aligned with a view of educational phenomena as complex dynamic systems.

Complexity in Student Learning: An Example from Sign Networks in Learning
Presenting Author: Richard Taylor, University of Oxford, United Kingdom; **Co-Author:**Judith Hillier, University of Oxford, United Kingdom; **Co-Author:**Ann Childs, University of Oxford, United Kingdom

Developing connections between words may be an important catalyst for conceptual development. This research uses a snowball sampling method to measure the structure of word (sign) networks formed by students learning mechanics (physics students) and students who have a more basic understanding of physics (psychology students). Key measures of network structure (e.g., shortest average path length, clustering coefficient) indicate that the networks of physics and psychology students have similar macro structures. Analysis of the network degree distributions suggest all the networks contain highly connected hub-words. Force concept inventory scores indicate that the participants in the physics group have a significantly better conceptual understanding of mechanics than the participants in the psychology group. Despite these differences in conceptual understanding, there are several hub-words that appear frequently in both the physicist and psychologist networks (*force*, *energy*, *time*, *particle*). These hub words are associated with key concepts in mechanics.*Mass* is the only hub-word that appears in most physicist networks but is absent as a hub-word in psychology networks. These findings suggest students need to develop new connections between keywords (e.g., *mass*) to develop their understanding of the concepts they need to understand mechanics. However, the presence of common hub-words in both the physics and psychology networks suggests parts of this sign structure develops before students have a fully coherent conceptual understanding of mechanics.

A Complex Dynamic Systems Perspective on Identity, Motivation, and Learning
Presenting Author: Avi Kaplan, Temple University, United States; **Co-Author:**Joanna Garner, Old Dominion University, United States

The rapid developments of society in the 21st century have revealed the limitations of the mechanistic, linear, and acontextual assumptions that are implicit in much educational research. Our increasingly volatile and uncertain world requires the reconceptualization of educational systems' goals, practices, and intended outcomes so that individuals are equipped to cope with ambiguity and change. In other scientific fields, the principles and methods of complex dynamic systems (CDS) have provided an ontological framework for describing the interdependent and nonlinear relations among system elements. In this presentation, we highlight how these principles are incorporated into a model of identity, motivation and learning called the Dynamic Systems Model of Role Identity (DSMRI). We provide examples from DSMRI informed research that underscores its applicability to 21st century learning contexts, which often require the educator and the learner to negotiate ambiguity, act in agentic ways towards previously undefined solutions, and navigate smoothly between disparate social contexts. We conclude with a call to action for educational researchers, practitioners, and policy makers, to engage in collaborative discussion and collective identity development towards the goal of recognizing and leveraging principles of CDS in the design, implementation, and evaluation of modern learning environments.

Investigating Educational Phenomena with Catastrophe Theory
Presenting Author: Dimitrios Stamovlasis, Aristotle University of Thessaloniki, Greece

Within Complex Dynamical Systems (CDS) perspective, catastrophe theory (CT) has a significant contribution. The CT modeling detects potential nonlinear

changes occurring in social and educational systems. Educational processes involve changes, which sometimes are smooth and gradual, but often are abrupt changes or sudden transitions between states. In this presentation, a lucid appraisal of the empirical research probing discontinuous changes is provided. The content embraces endeavors from various domains, such as cognitive, mental task execution, conceptual change, problem-solving, motivational and achievement goal theories, decision-making, and research probing the role of emotion under certain circumstances. It is demonstrated how the cusp catastrophe model has been applied to various research domains, what has been learned from the paradigm shift, how theory is informed and what are the benefits for the practice. In addition, a brief presentation of the statistical and methodological issues is provided and explained along with the theoretical underpinnings associated with Complex Dynamical Systems. Notions, such as asymmetry, bifurcation, hysteresis effect, bimodality, and behavioral attractors, are elucidated and explained within the new epistemological framework. The application of stochastic catastrophe theory is advantageous because it can be employed with cross-sectional data and model conflicting processes, which are omnipresent in social and educational systems.

Session L 12

25 August 2023 08:00 - 09:30
AUTH_DC2
Symposium
Motivational, Social and Affective Processes

Causes and effects of mathematics anxiety

Keywords: Achievement, Anxiety and Stress, Attitudes and Beliefs, Emotion and Affect, Gender Issues, In-service Teachers, Mathematics/Numeracy, Science and STEM, Self-efficacy
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Florence Gabriel, University of South Australia, Australia
Discussant: Thomas Hunt, University of Derby, United Kingdom

Anxiety disorders are among the most widespread mental health issues. In educational settings, anxiety expresses itself in many different ways, with mathematics anxiety (MA) being one of the most prevalent forms associated with learning. There is evidence that MA, the experience of fear and nervousness when participating in mathematical tasks, leads to poor performance in and avoidance of mathematics. Yet, being mathematically literate has been linked to greater access to STEM careers, positive life outcomes and well-being in adulthood. Therefore, there is a need to ensure students are engaged with mathematics throughout their schooling to promote interest in the pursuit of mathematics related degrees and careers. This symposium will first explore some of the root causes of MA, including student and teacher gender, and teachers' own MA. This symposium will also uncover the relationships between students' attitudes towards mathematics, self-efficacy, MA and their engagement in STEM subjects.

Math anxiety and math teaching anxiety: Are they independent and do they relate to pupils' outcomes?
Presenting Author: Kinga Morsanyi, Queen's University Belfast, United Kingdom; **Co-Author:**Andy Ash, Loughborough University, United Kingdom

This talk addresses two under-researched topics: the relation between mathematics teaching anxiety and teachers' mathematics anxiety, and their potential role in the development of pupils' mathematics anxiety and mathematics performance. To address these issues, in Study 1, 94 teachers reported their mathematics anxiety, teaching anxiety and general anxiety, together with a number of other variables relating to their teaching experience, job roles and the demographic characteristics of their pupils. In Study 2, 11 primary school teachers and 124 pupils from these teachers' classes participated. In addition to the variables measured in Study 1, pupils' mathematics anxiety, general anxiety and their mathematics performance were also assessed. The results of Study 1 indicated an exceptionally strong link between teachers' mathematics anxiety and their teaching anxiety, although the two constructs showed some divergent validity. This suggests that mathematics anxiety plays a very important role in teachers' confidence in their teaching abilities. Study 2 showed that neither mathematics anxiety nor teaching anxiety were significantly related to pupils' outcomes. Nevertheless, teachers' general anxiety was significantly related to pupils' mathematics anxiety after controlling for the effects of a number of covariates. These results do not lend support to the idea that teachers' anxiety about mathematics or teaching mathematics could be easily transmitted to pupils or that they would have significant effects on pupils' mathematics performance. Nevertheless, teachers' general anxiety (which reflects higher stress levels and could potentially be related to worse work conditions) was associated with an anxiety-provoking classroom climate.

The influence of student and teacher gender on students' maths anxiety : A whole school study
Presenting Author: Rebecca Marrone, University of South Australia, Australia; **Co-Author:**Fernando Marmolejo-Ramos, University of South Australia, Australia; **Co-Author:**Florence Gabriel, University of South Australia, Australia

Many future jobs will require mathematical skills, and despite efforts to promote the study of mathematics in schools, students often perceive it as negative and challenging. Additionally, girls typically experience higher levels of mathematics anxiety than boys. In this study, we examined 794 Australian school students using a whole school approach (K-12). Using a short survey, we observed how male and female students differ in their attitudes towards mathematics and their perceived mathematics anxiety, how these patterns differ by school year and the impact of teacher gender on students' responses. Our results show that girls reported significantly more negative words than boys. Moreover, we were able to identify the first signs of mathematics anxiety in girls in Year 3, with sharp increases in Year 6 and Year 10 (transition years). Finally, our results suggest that female teachers negatively impact female students' emotional response towards mathematics. The implications of the findings are discussed in light of current educational theories and pedagogy.

Mathematics anxiety and positive attitudes towards mathematics are not mutually exclusive
Presenting Author: Krzysztof Cipora, Loughborough University, United Kingdom; **Co-Author:**Serena Rossi, Loughborough University, United Kingdom; **Co-Author:**Hannah Connolly, University of York, United Kingdom; **Co-Author:**Alexander von Bergen, Swiss Federal Institute of Technology ETH Zurich, Switzerland; **Co-Author:**Vera Baumgartner, ETH Zurich, Switzerland; **Co-Author:**Manu Kapur, ETH Zurich, Switzerland; **Co-Author:**Venera Gashaj, University of Bern, Switzerland

Most existing studies on Mathematics Anxiety (MA), attitudes towards mathematics, as well as personality factors potentially related to mathematics performance, focused either on individuals revealing math difficulties or targeting heterogeneous samples not prespecifying their mathematics skills level. Students enrolled in elite STEM programs have been neglected in MA research, presumably because the general (implicit) assumption is that one must have positive attitudes towards mathematics to choose to study math-intense subjects. In this study conducted with STEM students in one of the most prestigious technical universities worldwide (N = 4597), we aimed to fill this research gap. We show that even though lower than in other groups of university students, MA is still present among elite STEM students. It also differs between students involved in programs comprising different amounts of mathematics. In parallel, the correlations between MA and positive feelings towards mathematics (e.g., feeling flow while doing mathematics or seeing beauty in mathematical formulas) were only moderately correlated (rs » -.25), suggesting that positive and negative feelings towards mathematics are not mutually exclusive. Even so, these correlations were considerably higher than correlations with measures of discriminant validity (considering positive emotions towards language / literature). Expectedly, MA correlated also with other types of anxiety (trait, state, test anxiety) and neuroticism, with estimates comparable to those observed in other groups.

Math self-efficacy, and not Math anxiety, steers students away from STEM
Presenting Author: Flávia H. Santos, University College Dublin, Ireland; **Co-Author:**Mariuche Gomides, University College Dublin, Ireland; **Co-Author:**Claire Elliott, University College Dublin, Ireland; **Co-Author:**Sara Caviola, University of Padova, Italy; **Co-Author:**Krzysztof Cipora, Loughborough University, United Kingdom

Math anxiety might prevent students from pursuing careers in STEM. Previous studies indicated that students with high math anxiety are more likely to avoid math-related courses and activities. However, studies controlling the effects of other possible confounding factors (e.g., math ability and attitudes towards math) simultaneously when examining the association between math anxiety and career choice are scarce. The present study aimed to investigate whether math

anxiety contributed to the undergraduates' likelihood of pursuing a career in STEM, their attitudes towards mathematics, and their perceived mathematics abilities. Data from 180 Irish and English undergraduate students were analysed. Regression models indicated that math anxiety was not a significant predictor of undergraduates' likelihood of pursuing a career in STEM after the effects of math fluency, math self-efficacy, trait anxiety, presence of math modules, and gender were controlled. However, math anxiety significantly predicted participants' attitudes towards mathematics and their perceived mathematics abilities. At odds with previous research, math-anxious individuals were not less likely to avoid a career in STEM. In fact, math self-efficacy, which was highly correlated with math anxiety, was the sole significant predictor of career choice. Nonetheless, math anxiety predicted a significant part of the variance of participants' attitudes towards mathematics and their perceived mathematics abilities. These results might indicate that math anxiety might play an indirect role in the association between beliefs and attitudes towards math and career choice.

Session L 13

25 August 2023 08:00 - 09:30
UOM_A13
Single Paper
Instructional Design, Learning and Special Education

Learning to Read and Write

Keywords: Competencies, Digital Literacy and Learning, Educational Neuroscience, Educational Technologies, Foreign and Second Language Acquisition, Game-based Learning, L1/Standard Language Acquisition, Learning Strategies, Meta-analysis, Parental Involvement in Learning, Primary Education, Reading, Synergies between Learning / Teaching and Research, Writing/Literacy
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 12 - Writing
Chairperson: Arniika Kuusisto, University of Helsinki, Finland

Reading and writing: The role of home literacy and emergent literacy skills
Keywords: Foreign and Second Language Acquisition, L1/Standard Language Acquisition, Parental Involvement in Learning, Writing/Literacy
Presenting Author:GIULIA VETTORI, University of Florence, Italy; **Co-Author:**Oriana Incognito, University of Florence, Italy; **Co-Author:**Lucia Bigozzi, University of Florence, Italy

This longitudinal study was aimed at investigating a pattern of relations between reading-related and writing-related home practices, kindergartners' emergent literacy skills, and later children's reading and writing skills in primary school. Participants included 115 kindergarten children learning Italian language (Mean age (SD)=4.88 (.36); 43% female). Each child in preschool completed emergent literacy tasks to test the phonological and notational skills. Information concerning home literacy environment and practices was obtained through a questionnaire completed by parents during kindergarten. Later, in primary school, each child completed a standardised dictation task to assess orthographic accuracy and fluency and a reading task to assess reading accuracy and speed. Two major findings of mediational models were that: (1) notational skills totally mediate the relationship between home literacy and reading speed (B=-.17 p

Learning to read: From an umbrella review of reading research to an educator's practice guide
Keywords: L1/Standard Language Acquisition, Meta-analysis, Reading, Synergies between Learning / Teaching and Research
Presenting Author: Jordi Casteleyn, Antwerp University, Belgium; **Co-Author:**Mathea Simons, University of Antwerp, Belgium; **Co-Author:**Tom Smits, Antwerp University, Belgium

Just a small number of review studies discuss all essential aspects of learning to read in all stages of formal education (from pre-primary to secondary education). Moreover, insights from these review studies have sometimes difficulty finding their way into the classroom. This project aims at answering two research questions: RQ1) What are the features of effective reading education in pre-primary, primary and secondary education? What are the factors that influence it?, and RQ2) How to bridge the gap between research into reading instruction and practice? To answer RQ1, we chose to follow the procedure of an umbrella review, which only uses systematic reviews, with or without a meta-analysis. After identifying studies (N=385) based on relevant keywords, and excluding studies on the basis of title, abstract and full text (n=236), we assessed the methodological quality, which resulted in an additional 52 studies being excluded. Eventually, 99 studies provided the basis to formulate conclusions regarding reading instruction. To answer RQ2, a practice guide about effective reading instruction was created based on the insights of RQ1. We used the method of design-based research, in which both teachers (N=30, 10 per stage of formal education) and expert researchers (N=3) were involved in the process. To our knowledge, this study is one of the few projects that provide a structured empirical basis for the process of learning to read, from pre-primary to secondary education, and align this with practical advice.

The influence of writing medium and gesture modality on the development of early literacy skills
Keywords: Digital Literacy and Learning, Educational Technologies, Game-based Learning, Writing/Literacy
Presenting Author: Theresa Kalchhauser, Faculdade de Psicologia e de Ciências da Educação da Universidade do Porto, Portugal; **Co-Author:**Mariana Silva, Faculdade de Psicologia e de Ciências da Educação da Universidade do Porto, Portugal; **Co-Author:**Rui Alexandre Alves, University of Porto, Portugal

Writing and reading skills are cornerstones in the structure of many education systems. As digitalization is increasingly replacing analogue writing media, its efficiency must likewise be scrutinised. While some findings support the view that writing with keyboards leads to superior letter learning (Mayer et al., 2020), there are also opposing considerations (James, 2017; Longcamp et al. 2008; Seyll & Content, 2022; Wiley & Rapp, 2021) favouring handwriting. Still, hardly any study has systematically manipulated writing medium and gesture modality across an ecologically valid intervention aiming at teaching alphabet letters to kindergarteners. In the current project we address this research gap. We aimed to test which writing media and gesture modalities may work best to foster literacy skills in children. In a planned intervention of eight weeks, we manipulated writing medium [paper vs. tablet] and gesture modality [handwriting vs. tapping], thus adopting a 2 x 2 experimental design. Therefore, we studied four experimental groups (n = 106) and compared them to a non-intervention control group (n = 35). Intervention effects were tested using Generalised Linear Models (GLM). The results show that digital or analogue writing media had limited impact on kindergartners literacy learning. Regarding gesture modality, younger kindergartners profited more from tapping whereas the older ones benefited more from handwriting. In sum, besides offering concrete findings on the efficient use of writing medium and gesture modality for researchers and teachers, this study delivers analogue and digital working materials for preschool and remedial interventions.

Dot-to-dot Practice Enhances Children's Handwriting:
Keywords: Competencies, Educational Neuroscience, Learning Strategies, Primary Education
Presenting Author: Esther Adi-Japha, Bar-Ilan University, Israel; **Co-Author:**Rafat Ghanamah, Oranim Academic College of Education+ The University of Haifa, Israel; **Co-Author:**Hazar Eghbaria-Ghanamah, The University of Haifa, Israel; **Co-Author:**Avi Karni, Haif University, Israel

Handwriting instruction commonly involves the practice of non-linguistic writing-like patterns. In here, we report the effect of practicing the invented letter task (ILT), a dot-to-dot connecting letter-form task, under different scheduling conditions on Arabic sentence-writing. Ninety-seven 7- to 8-year-old Arab Israeli second-graders were assigned to five study groups: three single-session practice groups (6/12/24 blocks), a 24-block multi-session practice group, and an untrained control group, comparing the amount (90/180/360 repetitions) and parsing over time (massed/distributed) of practice. Handwriting was assessed at pre-training, 24-hr, and 4–5 weeks post-training. Although, by 4–5 weeks post-training, the single-session 12-block practice group was the most fluent and accurate in the trained ILT, the 24-block multi-session practice group's handwriting performance proved to be superior to that of the other groups in terms of speed and outperformed the control group in terms of legibility. The findings suggest that practicing simple grapho-motor tasks may enhance handwriting abilities.

Session L 14

25 August 2023 08:00 - 09:30

UOM_CR
Single Paper
Instructional Design

Fostering Motivation through Instructional Design

Keywords: Achievement, Attitudes and Beliefs, Classroom Assessment, Classroom Management, Emotion and Affect, Feedback, Instructional Design, Interest, Motivation, Multimedia Learning, Science and STEM
Interest group: SIG 01 - Assessment and Evaluation, SIG 06 - Instructional Design
Chairperson: Bjorn Wansink, Utrecht University, Netherlands

Automated, Negative Performance Feedback Harms Students' Emotions (Less when it is Elaborated)
Keywords: Emotion and Affect, Feedback, Instructional Design, Motivation
Presenting Author: Livia Kuklick, IPN - Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Dr. Marlit Annalena Lindner, IPN - Leibniz Institute for Science and Mathematics Education, Germany

In computer-based assessments, immediate performance feedback risks to negatively influence test-taker emotions and motivation after incorrect responses (i.e., implying task-related failure). Thus, special attention needs to be payed to the design of such negative feedback messages. To find ways to provide negative performance feedback in the least motivationally and emotionally detrimental way, this experimental study compared a no-feedback control group with three groups that either received *Knowledge of Results* (KR), *Knowledge of Correct Response* (KCR), or *Elaborated Feedback* (EF) after incorrect responses paired with KCR feedback after correct responses. As expected, feedback had a beneficial impact on student emotions after correct responses and a detrimental impact on students' emotions after incorrect responses. Moreover, feedback enhanced the success expectancy of higher performers, while it reduced those of lower performers. The content of the negative feedback messages played a secondary role for motivational outcomes. Yet, elaborated feedback content mitigated the detrimental affective impact of error notifications (i.e., "Your response was wrong"). Overall, our data suggest that immediate performance feedback is affectively and motivationally beneficial after correct responses (i.e., confirmative feedback). However, more elaborated feedback messages seem to help mitigate the detrimental impact of error notifications on students' emotions.

The Relationships between Pedagogy, Motivation, and Perception of the Learning Environment
Keywords: Attitudes and Beliefs, Classroom Assessment, Classroom Management, Motivation
Presenting Author: Irit Sasson, Tel-Hai College, Israel; **Co-Author:**NETA GAVISH, Tel-Hai College and Shamir Research Institute, Israel; **Co-Author:**Joy Benatov, University of Haifa, Faculty of Education, Israel

Recent changes in pedagogy design include flexible learning methods, based on the constructivist approach, that address student diversity according to the philosophy of universal design for learning. The implementation of pedagogical practices with these approaches are seen as essential in the development of the 21st century skills. To be well prepared to cope with the modern societal demand for lifelong learning, students need high and sustainable motivation. Research indicates a positive relationship between students' perception of the learning environment and motivation, yet the relationships between these variables and the implementation of best pedagogical practices by teachers have not been sufficiently studied. This study investigated the moderating effect of selected best pedagogical practices on the relationship between students' perception of the learning environment and motivation. Students' intrinsic motivation and perceptions regarding the learning environment were assessed through close-ended questionnaire filled out by 887 4th-6th grade students. In addition, we conducted 704 observations in the classes of these students to assess the expression of selected pedagogical practices: student vs. teacher centered learning; collaborative learning; integrating tasks that encourage choice; integrating tasks that address differences between learners; encouraging students to ask questions; integrating technological tools; providing personal attention; and managing classroom discipline events. A moderate, positive, and significant correlation was found between students' intrinsic motivation and their perceptions regarding the learning environment. Four pedagogical practices were found to significantly moderate this relationship: student centered learning; collaborative learning; integrating tasks that encourage choice; and tasks that address differences between learners.

Making lectures more interesting? - Effects of a Utility Value Intervention
Keywords: Instructional Design, Interest, Motivation, Science and STEM
Presenting Author: Nathalie John, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Franziska Baier, Goethe-Universität Frankfurt, Germany; **Co-Author:**Sebastian Korinth, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Mareike Kunter, DIPF | Leibniz Institute for Research and Information in Education, Germany

Students spend some time during lectures with off-task behaviour (e.g., checking their mobile phones) and therefore missing important parts of the lecture and not being in a state of interest (Risko et al., 2012). Utility-value interventions, which emphasize the usefulness of the learning material to learners' lives, are a promising approach to increase students' situational interest in lectures (Canning & Harackiewicz, 2015). This study uses an experimental pre-post design to examine the effects of a utility-value intervention on students' situational interest and knowledge gain during a short lecture about logarithm. A positive main effect on students' perceived usefulness is shown, but not on enjoyment or knowledge acquired through the lecture. For attention, there is a moderation effect: students with high individual interest in mathematics benefit from the intervention in terms of their attention. The results show that utility-value intervention in which the utility information is already included in the learning material can have an impact on students' attention and perceived usefulness and provide important clues for the design of lectures.

Multimedia Learning with Cartoons: A Test of the Emotional Design Hypothesis
Keywords: Achievement, Emotion and Affect, Instructional Design, Multimedia Learning
Presenting Author: Fangzheng Zhao, University of California, Santa Barbara, United States; **Co-Author:**Richard Mayer, University of California, Santa Barbara, United States

What is the effect on students' learning outcomes and learning experiences of converting a narrated slideshow on lightning formation with black-and-white line drawings (original group) into one in which the key elements are rendered as colorful cartoon-like characters (cartoon group)? We conducted two between-subjects experiments in which participants were randomly assigned to the group. The narrator's voice in both groups was a computer-generated female happy voice in Experiment 1 or a real female happy voice in Experiment 2. The cartoon group scored higher on a transfer posttest than the original group in both experiments. On subsequent questionnaires, the cartoon group reported feeling more positive (i.e., happy and content) during learning than the original group (in Experiment 1 and the combined experiments); and reported that the instructor was more engaging, better at facilitating learning, and more human-like (in Experiment 2 and the combined experiments). The results are consistent with the emotional design hypothesis, which predicts better learning from lessons in which key elements induce positive emotions.

Session L 15

25 August 2023 08:00 - 09:30
UOM_R05
Single Paper
Learning and Instructional Technology, Motivational, Social and Affective Processes

Feedback in Technology-Enhanced Learning

Keywords: Computer-assisted Learning, Cooperative/Collaborative Learning, Educational Technologies, Emotion and Affect, Feedback, Goal Orientations, Higher Education, Learning Analytics, Mathematics/Numeracy, Motivation

Interest group: SIG 01 - Assessment and Evaluation, SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Sarah Crafter, The Open University, United Kingdom

Effects of Computer-Based KCR and AUC Feedback on Affective-Motivational Outcomes
Keywords: Computer-assisted Learning, Emotion and Affect, Feedback, Motivation
Presenting Author: Ute Mertens, IPN - Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Marlit Annalena Lindner, IPN - Leibniz Institute for Science and Mathematics Education, Germany

Computer-based feedback is on the rise in educational assessments. Research has focused on the impact of feedback on learning, but few studies have examined how different feedback types affect test-takers' affective-motivational states. In this experiment, we employed a within-subject design with a variation of three automated item-level feedback types (i.e., no feedback, *Knowledge of Correct Response* [KCR] feedback, and *Answer-Until-Correct* [AUC] feedback) that were organized in three blocks, each containing 12 items. A final sample of 335 university students solved a total of 36 computerized multiple-choice tasks covering topics regarding the domains of physics, chemistry, and biology. We assessed students' achievement emotions (i.e., enjoyment, pride, anger, and frustration) and motivation (i.e., perceived knowledge acquisition, utility value, and perceived cost) at the item-level across the test. Results of linear mixed effect models indicated that both KCR and AUC feedback positively influenced students' achievement emotions and motivation as compared to no feedback. However, further moderator analyses revealed that the feedback effects are performance-dependent, indicating pronounced positive effects after correct answers as compared to incorrect answers. Furthermore, AUC and KCR feedback did not significantly differ regarding their effects on students' affective-motivational outcomes.

Effects of feedback and cooperative learning on knowledge acquisition in online flipped classrooms
Keywords: Cooperative/Collaborative Learning, Educational Technologies, Feedback, Higher Education
Presenting Author: Ruben Schlag, University of Passau, Germany; **Co-Author:**Karsten Stegmann, University of Passau, Germany; **Co-Author:**Maximilian Sailer, University of Passau, Germany

The (online) flipped classroom approach has increasingly been implemented in higher education. In flipped classrooms, declarative knowledge is acquired individually by learners. This process seeks to foster the subsequent generation of application-oriented knowledge during an in-class lesson. However, it is unclear to which extent the acquisition of declarative knowledge can be supported through different types of feedback in online flipped classrooms, and whether deficits in declarative knowledge can be compensated for with cooperative learning. To test these effects, we employed a 2x2 experimental design in an online flipped classroom course on empirical research methods (N=105) in the social sciences. We investigated the effects of 'type of feedback' (simple vs. elaborated) during a quiz on declarative knowledge and 'social form' during an application-oriented exercise (individual vs. cooperative). Elaborated feedback exerted a significant, medium effect on declarative and application-oriented knowledge. A mediator analysis showed that about half of the effect on application-oriented knowledge was mediated by declarative knowledge. Results suggest that elaborated feedback can foster declarative knowledge acquisition during individual learning phases in online flipped classrooms. Subsequently, this process also positively influenced the formation of application-oriented knowledge during the in-class learning phases. Challenges of this research are discussed, such as low test scores by students or dropouts from the data set.

Friends or Feedback?–Computer Science Students' Goals' and Their Intention to Use a Feedback-Tool
Keywords: Educational Technologies, Feedback, Goal Orientations, Higher Education
Presenting Author: Tugce Özbek, Augsburg University, Germany; **Co-Author:**Tobias Mömke, Augsburg University, Germany; **Co-Author:**Aida Roshany, Augsburg University, Germany; **Co-Author:**Ingo Kollar, Augsburg University, Germany

Digital technologies offer various benefits for student learning. However, a lack of technology acceptance might hinder students from using certain digital tools. The UTAUT-model specifies performance expectancy, effort expectancy and facilitating conditions as relevant factors that influence the intention to use a technology. Yet, little is known about learner characteristics that influence the intention to use a tool. Therefore, we investigated the effects of different achievement goals of N=155 computer science students on their intention to use an online peer feedback tool. More specifically, we examined the effects of learning approach goals, appearance approach goals and relational goals on students' intention to use. The results indicated that learning approach goals significantly predicted the intention to use the feedback tool. No effect was found for appearance approach goals. Surprisingly, a negative effect was observed for relational goals. Learning goals of students might therefore also be associated with a higher intention to use the feedback tool. The missing effect of appearance approach goals might indicate that they may not be very decisive in the context of a digital interaction within the feedback tool. Also, students with this primary goal might not want to help other students in order to perform best themselves. Lastly, the negative association of relational goals raises the question to what extent tools that imply social interactions are related to relational goals.

Learning analytics supporting mathematical thinking
Keywords: Educational Technologies, Feedback, Learning Analytics, Mathematics/Numeracy
Presenting Author: Sanna Oinas, University of Helsinki, Finland; **Co-Author:**Mikko Asikainen, The University of Helsinki, Finland; **Co-Author:**Mari-Pauliina Vainikainen, Tampere University, Finland

Each student's mathematical thinking develops at their own pace. Often in the classroom, it is almost impossible for the teacher to offer materials of a suitable level to each student who learns and progresses at their own pace. Therefore, in this study learning analytics were implemented in order to design an adaptive digital learning environment to support the development of mathematical thinking. A total of 2773 students in lower secondary education participated in study, where data were collected in three time points. In the first data collection time point students solved tasks within 15 minutes. In the second and third times, students had the opportunity to seek feedback and check immediately whether the answer for the mathematical problem was correct or incorrect. Results from longitudinal SEM show that the more students seek feedback the better they performed. There were also 15% of students who did not invest enough time for the tasks in order to show any progress. Overall, a slight development was reached in students mathematical thinking. Results give encouraging evidence for designing adaptive learning environments to support individual learning in the future.

Session L 16

25 August 2023 08:00 - 09:30
UOM_R09
Single Paper
Learning and Instructional Technology, Learning and Social Interaction, Teaching and Teacher Education

Using Video to Support the Social Aspects of Learning

Keywords: Attitudes and Beliefs, Classroom Management, Educational Technologies, Higher Education, Multimedia Learning, Pre-service Teachers, Qualitative Methods, Social Aspects of Learning and Teaching, Social Interaction, Social Media, Teaching/Instructional Strategies, Video-based Learning
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Esther Brunner, Switzerland

Students' acceptance and confidence in the use of video pedagogy in higher education
Keywords: Attitudes and Beliefs, Educational Technologies, Higher Education, Video-based Learning
Presenting Author: Anja Garone, University College Leuven Limburg, Belgium; **Co-Author:**Greet Fastré, University College Leuven Limburg, Belgium; **Co-Author:**Kiara Billiau, University College Leuven Limburg, Belgium; **Co-Author:**Steven Verjans, University College Leuven Limburg, Belgium; **Co-Author:**An Verburgh, University College Leuven Limburg, Belgium

This study explores the use of video pedagogy in higher education programs. 7 pilot studies were set up in one university college in Belgium. A pre-test

measurement of students' technology acceptance and confidence in the use of video registrations of 137 participating students from 5 of the first pilots shows that students feel strongly about the potential effort expectancy and support required by the method. Students also seem to have strong reservations regarding how and by whom the videos will be used in the classroom. The study concludes that important considerations need to be made to ensure privacy and safe handling of video materials, while communicating clearly the added value of video pedagogy to the students.

The Contribution of Narrative Video production to SEL in Education.
Keywords: Multimedia Learning, Social Aspects of Learning and Teaching, Social Media, Video-based Learning
Presenting Author: Evanna Ratner, Gordon Academic College, Israel

In a course reflecting migrants' characteristics, German and Austrian overseas students in Israel, had to create short narrative videos, to tell a short story using storytelling skills and find a conflict moment in order to resolve it.
It was the first semester of 2022. Few students looked at the refugees fleeing from Ukraine and told their stories,others looked back and created their own story, asking their parents and grandparents about their lives during the Second World War. In this article one story will be presented to emphasize the Contribution of Narrative video making to SEL in Education. Doris, a german student studing in Israel, found out during this course that her great grandfather hid a Jew in the house barn. Years later, her grandmother kept in touch with him, and after many years, he turned to be her second husband. This was new to Doris, , she found out her story only because she asked for a dilemmatic story within her family and produced a short video about it. Stories of a troubled life need to be heard and by giving them a voice, asking questions and coping with different possibilities, there can be redemption to conflicts. In this presentation we will reflect on the method of Empathetic discourse, and what is the contribution of narrative video creation to SEL in education. Only Few studies look into the socio-emotional impact of these experiences on learners , this study is one of them.

Using Video to Support Student-Teachers' Classroom Management During Early Field Placement
Keywords: Classroom Management, Pre-service Teachers, Qualitative Methods, Video-based Learning
Presenting Author: George Olympiou, University of Cyprus, Cyprus

The purpose of this study was to investigate how the use of video enhanced four student teachers' (STs) experimentation with classroom management (CM) practices during early field placement. A combination of CM models was used during early field placement coursework whereas during practice STs were able to videotape and analyze their lessons, reflecting on both theory and practice. The use of video was considered crucial in supporting STs' teaching practice while implementing particular aspects of CM. The four STs were working in pairs and focused on two themes, namely, developing procedures and routines and on effective time management practices. The two themes were selected based on STs' practice which was blended with a structured early field placement coursework on CM. The use of video helped both pairs to identify CM issues on both themes and elaborate on what was discussed during coursework. The cross-case analysis revealed STs' ability to teach and enhance procedures and routines after the early field placement coursework. The use of video enhanced STs' reflection on procedures and routines while also leading them to crucial realizations in developing particular practices for managing time efficiently. Despite challenges related with STs' enactment on routines and time management as well as inconsistencies between planning and enactment, such results enhance the idea of introducing a particular methodology of using video for providing STs' with a place to begin with CM during their (early) field placement.

A review of interactive use of video for learning and assessment in higher education
Keywords: Higher Education, Social Interaction, Teaching/Instructional Strategies, Video-based Learning
Presenting Author: Magnus Hontvedt, University of Southeastern Norway, Norway; **Co-Author:**Charlotte Beal, University of South-Eastern Norway, Norway; **Co-Author:**Thomas de Lange, University of South-Eastern Norway, Norway; **Co-Author:**Marit Skarbø Solem, Faculty of Humanities, Sports and Educational Science, Norway; **Co-Author:**Tonje Stenseth, University of South-Eastern Norway, Norway

Video-based technologies have become increasingly important in higher education, especially concerning online teaching. Interactive uses of video, such as watching a video together with a peer, have proved to increase the effectiveness of videos for learning. The current review focuses on *interactive uses of video*, defined as video usage through which students actively respond to and engage with each other, either by using an online platform or by using video as a shared object of scrutiny in co-located settings. Existing reviews tend to provide a bird's-eye view of the use of video for learning and assessment. We find it pertinent to review explorative studies that investigate such practices in depth. Accordingly, we employ a framework synthesis approach to review research on the interactive use of video technology for learning and assessment in higher education. We found more studies that cover interactive use of video as part of learning designs than of assessment and fewer studies that analyse learning activities and assessment in relation to each other. The studies cover a range of tools, strategies and objectives for configuring video into learning designs and assessment practices in a wide range of subjects. There seems to be a lack of a unified research agenda and a need to gain conceptual clarity. Through the review work, we generated a thorough conceptual framework that provides an overview and a better understanding of this emerging research field.

Session L 17

25 August 2023 08:00 - 09:30
UOM_R08
Single Paper
Educational Policy and Systems, Teaching and Teacher Education

Instructional Quality: Teacher- and Teaching-Related Factors

Keywords: Achievement, Attitudes and Beliefs, Cultural Diversity in School, In-service Teachers, Instructional Design, Meta-analysis, Primary Education, Qualitative Methods, School Effectiveness, Teacher Effectiveness, Teacher Efficacy, Teaching Approaches, Teaching/Instructional Strategies
Interest group: SIG 11 - Teaching and Teacher Education, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Carolina Rodríguez Llorente, Universidad de La Coruña, Spain

The role of teacher characteristics for instructional quality: A meta-analysis
Keywords: Instructional Design, Meta-analysis, Teacher Effectiveness, Teacher Efficacy
Presenting Author: Nicoletta Bürger, University of Hildesheim, Germany; **Co-Author:**Katharina Engelmann, Universität Hildesheim, Germany; **Co-Author:**Laura Schultze, Universität Hildesheim, Germany; **Co-Author:**Gabriele Prinz, University of Hildesheim, Germany; **Co-Author:**Marvin Scott Schlamelcher, University of Hildesheim, Germany; **Co-Author:**Jürgen Menthe, University of Hildesheim, Germany; **Co-Author:**Barbara Schmidt-Thieme, University of Hildesheim, Germany; **Co-Author:**Christof Wecker, Universität Hildesheim, Germany

Instructional quality with its sub-dimensions of learning support, classroom management and cognitive activation has been a core topic in research on teaching for several decades. Factors that may influence instructional quality include teacher characteristics such as teachers' professional knowledge and their beliefs and motivational orientations. A systematic overview of empirical evidence concerning relevant teacher characteristics and a critical assessment of their relative importance for instructional quality is currently lacking. The present paper reports on a meta-analysis that investigates to what extent a broad array of cognitive and motivational teacher characteristics is related to instructional quality. A literature search using ERIC, PsycINFO and Psyndex followed by an initial screening based on titles and abstracts and a second selection step based on the full texts has yielded 45 studies so far. Correlation coefficients extracted from the studies are integrated by means of a meta-analytical structural equation model (MASEM). First results indicate that both teachers' self-efficacy and their professional knowledge have a significant small positive association with instructional quality. Subsequent analyses will include relationships of further teacher characteristics instructional quality. The results of this meta-analysis can provide important information for teacher training as to which aspects are particularly relevant as potential targets for teacher training.

Teachers' attributes for academic optimism: understanding its development for equity and excellence
Keywords: Attitudes and Beliefs, Cultural Diversity in School, School Effectiveness, Teacher Efficacy

Presenting Author: Ruud Lelieur, University of Antwerp, Belgium; **Co-Author:**Ruben Vanrusselt, University of Antwerp, Belgium; **Co-Author:**Noel Clycq, University of Antwerp, Belgium; **Co-Author:**Jan Vanhoof, University of Antwerp, Belgium

Teacher academic optimism (TAO) is an important teacher characteristic influencing student achievement, even after controlling for background variables such as SES and migration. Academically optimistic teachers believe they can make a difference, build trusting relationships with students and parents, and focus on learning. This study examines how teachers attribute causes for high or low levels of TAO (RQ1) and the role of the number of disadvantaged students and the level of school academic optimism (SAO) in making these attributions (RQ2). Data were collected through semi-structured interviews with 16 teachers from eight secondary schools differing by the level of SAO and the number of disadvantaged students. Matrix coding queries and cluster analysis show that teachers attribute causes for high degrees of TAO both internally and externally, but mainly stable and controllable. Low levels of TAO are attributed exclusively externally and outside their control, but both stable and unstable. In addition, teachers in academically optimistic schools are more likely to attribute high levels of TAO to positive school characteristics that are stable and controllable. Moreover, they explain low levels of TAO less frequently with causes referring to students' disadvantaged backgrounds, compared to colleagues from less optimistic schools. In conclusion, teachers in academically optimistic schools seem to speak differently about their students, their school, and themselves. In the way they attribute low or high levels for TAO opportunities are seen and responsibilities are recognised. This creates possibilities for increasing academic optimism by addressing teachers' perceptions and attributions. Theoretical and practical implications are presented.

Teacher Training for Whole Child Outcomes: Evidence of the impact of Teach For Nigeria

Keywords: Achievement, In-service Teachers, Primary Education, Teacher Effectiveness

Presenting Author: Kata Mihaly, RAND Corporation, United States; **Co-Author:**Jonathan Schweig, RAND Corporation, United States; **Co-Author:**Elaine Wang, RAND Corporation, United States; **Co-Author:**Sabrina Lee, RAND Corporation, United States

Substantial research has shown that classroom teachers play a critical role in shaping the lives of young people in their classrooms, both academically and in terms of their social and emotional development. Given this, initiatives focused on improving teacher recruitment, training, and development pipelines may be critical to improving schools and the lives of young people. This paper summarizes the results of a mixed-methods quasi-experimental study evaluating the impacts of Teach For Nigeria (TFN) on student development, teaching practice, the quality of the learning environment, and school climate. It is the first rigorous study of a large-scale teacher certification program in Nigeria, and the first of which we are aware to focus on academic and non-academic outcomes. We found evidence that student academic achievement improved more for students of TFN teachers compared to students of non-TFN teachers in both math and reading. We found limited evidence that the TFN program impacted student social and emotional learning, quality of teaching, and the wider school community. Qualitative data from a subsample of TFN schools suggest TFN teachers' classrooms have distinct characteristics that support students' academic and social and emotional development. Implications of results for teacher training programs are discussed.

Adaptive Teaching: What Research on Learning and Instruction Can Learn from Schools

Keywords: Primary Education, Qualitative Methods, Teaching Approaches, Teaching/Instructional Strategies

Presenting Author: Hanna Dumont, University of Potsdam, Germany; **Co-Author:**Jasmin Decristan, University of Wuppertal; IDeA-Research Center, Germany; **Co-Author:**Benjamin Fauth, Institute for Educational Analysis, Germany; **Co-Author:**Nora Fröhlich, Institute for Educational Analysis, Germany; **Co-Author:**Ann-Kathrin Jaekel, University of Tuebingen, Germany; **Co-Author:**Simon Ohl, University of Potsdam, Germany; **Co-Author:**Enkeleta Shtërbani, Bergische Universität Wuppertal, Germany

In recent years, many researchers, practitioners and policy-makers alike call for adapting teaching to student differences in order to better meet the needs of each student. However, we still know little about how such a pedagogical approach of adapting teaching may actually look like in practice. Using a purposive sample of 20 award-winning, innovative schools, the present study aimed to fill this gap by conducting interviews with the school principals of these schools on their pedagogical approach in dealing with student heterogeneity. The results show that the nature of learning and instruction in these schools looks very different from a typical teacher-led classroom instruction. For instance, students follow their own learning path via methods of differentiation and individualization, there is a lot of flexibility in terms of time and space. Further, teachers work together in multi-professional teams. This implies that the typical research tools used to measure teaching quality and teaching effectiveness may need to be adjusted for the study of adaptive teaching in order to account for its complex nature.

Session L 18

25 August 2023 08:00 - 09:30
UOM_A07
Single Paper
Motivational, Social and Affective Processes, Teaching and Teacher Education

Personality, Motivational and Emotional Aspects in Teaching and Mentoring

Keywords: Achievement, Anxiety and Stress, Emotion and Affect, Higher Education, In-service Teachers, Mentoring and Coaching, Motivation, Personality, Pre-service Teachers, Qualitative Methods, Quantitative Methods, Secondary Education, Teacher Efficacy, Teacher Professional Development, Well-being
Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education
Chairperson: Lito Eleni Michalopoulou, Aristotle University of Thessaloniki, Greece

What do pre-service teachers' personality scores measure? A longitudinal study on college admission

Keywords: Achievement, Higher Education, Personality, Pre-service Teachers

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Personality in teacher education is ensnared by an ongoing and recurring debate. Along this debate, countries have instated college admission processes to initial teacher education (ITE). Therein, personality traits play a vital role. This raises the concern whether prospective pre-service teachers – like other applicants – are prone to present themselves more favourably than they would otherwise. To address this concern, we scrutinize if personality assessed in a selection process to ITE retains its predictive validity for academic achievement. Furthermore, we scrutinize if distorting effects of selection processes can be removed from personality responses.
We do so in a four-year long longitudinal study on pre-service teachers' personality traits and their academic achievement. Personality (i.e. Big Five) was assessed in the selection process to ITE and 10 month later in a neutral setting. Academic achievement was assessed by grade point averages over pre-service teachers' entire bachelor's degree.
Results showed that pre-service teachers presented themselves more favourably for selection. However, their rank-order stabilities were as expected (mean r = .503). Predictive utilities were retained, but could be increased by accounting for general and item-specific response distortions. For applicants, the general response distortion even contributed to the predictive utility.
In summary, our results bolster the use of personality assessment for selection to ITE. To sophisticate personality assessment in selection to ITE, we advocate modelling of applicants' general response distortion. Such consideration may increase the effectiveness of educational policies instating selection processes for prospective pre-service teachers.

Teacher emotions and their antecedents in the team-taught classroom from the teachers' perspective

Keywords: Emotion and Affect, In-service Teachers, Qualitative Methods, Secondary Education

Presenting Author: Franziska Muehlbacher, University of Salzburg, Austria; **Co-Author:**Gerda Hagenauer, University of Salzburg, Austria; **Co-Author:**Melanie M. Keller, IPN Leibniz Institute for Science Education, Germany

Teachers experience many emotions during teaching, which influence the teacher-student relationship, teachers' instructional quality and their well-being. This study investigates teacher emotions in the team-teaching setting. During team-teaching lessons, two teachers are responsible for classroom teaching. Based on an appraisal-theoretical understanding of emotions, we assume that one teacher experiences emotions within the social interactions they have with their team partner in the classroom. This study aims to examine which discrete emotions team teachers experience because of their partner teacher and their causes. To this end, we conducted qualitative, semi-structured online interviews with 30 Austrian team teachers in lower secondary education. The interviews were transcribed verbatim and analysed using structuring, qualitative content analysis. Overall, we found that team teaching is highly emotional for teachers. Regarding teachers' discrete emotions, we identified 44 distinct positive and negative emotions (e.g. joy, gratitude, anger, insecurity). Concerning the antecedents of emotions, we found eight major categories. A team's shared understanding of goals and values, the team-teaching setting itself, characteristics of the collaboration (e.g. support), and characteristics of the team partner's lesson (e.g. teaching style) were named as elicitors of emotions. Team teachers furthermore reported that characteristics of the team partner (e.g. approach to mistakes), of oneself (e.g. achievement pressure during team-teaching), of the team partner's relationship with students (e.g. (un)fair treatment) and of the team's interpersonal and professional relationship (e.g. interruptions) can trigger positive and negative emotions in the team-taught classroom. The results will be discussed in relation to high-quality team-teaching practices and teacher professionalisation.

Associations between mentor teachers' motivation and their behavior and enthusiasm in mentoring
Keywords: Mentoring and Coaching, Motivation, Quantitative Methods, Teacher Professional Development
Presenting Author: Clara Kuhn, University of Salzburg, Austria; **Co-Author:**Gerda Hagenauer, University of Salzburg, Austria; **Co-Author:**Alexander Groeschner, Friedrich Schiller University Jena, Germany; **Co-Author:**Andreas Bach, University of Salzburg, Austria

The quality of school-based mentoring plays a crucial role in the professional development of students in school placements. The importance of mentor teacher motivation is also considered relevant for the quality of mentoring. Against the background of the expectancy-value-theory (Eccles & Wigfield, 2002), the study examines the extent to which the expectations and values that mentors attach to mentoring are associated with constructivist vs. transmissive mentoring styles and the enthusiasm of mentor teachers. In this study, *N*=189 Austrian mentor teachers were surveyed in an online questionnaire about their mentoring behaviour. The path-analytical results show that high expectations of success and a high attribution of values related to the social utility value of mentoring are associated with higher constructivist behaviour in mentoring. Transmissive behaviour in mentoring, on the other hand, correlates positively with the extrinsic personal utility value of mentoring. With regard to enthusiasm for mentoring, the results show that enthusiasm is high when the mentor teachers have a strong intrinsic motivation and mentoring has a high intrinsic personal utility value for them. From the findings, it can be concluded that the motivation of the mentor teachers contributes to explaining differences in the quality of mentoring.

Beginning teachers' basic psychological needs: a multi-informant to optimize initial guidance
Keywords: Anxiety and Stress, Secondary Education, Teacher Efficacy, Well-being
Presenting Author: Silke Hellebaut, University of Ghent, Belgium; **Co-Author:**Katrien De Cocker, Ghent University, Belgium; **Co-Author:**Leen Haerens, Ghent University, Belgium

Beginning teachers frequently experience difficulties in dealing with many challenges related to teaching (Veenman, 1984).This often results in high dropout among beginning teachers (Borman & Dowling 2008; Fantilli & McDougall, 2009). To avoid this early drop-out, optimal initial guidance is needed (Ingersoll & Strong, 2011). In previous studies the positive impact of initial guidance initiatives have been shown (Ingersoll & Strong, 2011). However, it is still not clear how the initial guidance can be optimally organized to take into account the psychological well-being and degree of self-efficacy of beginning teachers, which are crucial teacher characteristics related to teacher retention. For these reasons, the aim of this study is to investigate (1) which factors influence the psychological well-being among beginning teachers, (2) which factors influence the perceived self-efficacy of beginning teachers, and (3) what does means for the initial guidance of beginning teachers. To answer these research questions, video interviews were conducted in a sample of 33 beginning teachers. We found that especially the administrative tasks and the high workload during the first weeks of teaching negatively influenced the psychological well-being. Further, the lack of classroom management and feeling less competent in the role of a class teacher were the factors that negatively influence self-efficacy. In addition, this study shows the need to develop more teacher-tailored initial guidance. Further implications will be discussed. Key words: initial guidance, teachers well-being, stress, job satisfaction, self-efficacy

Session L 19

25 August 2023 08:00 - 09:30
UOM_A10
Single Paper
Assessment and Evaluation, Learning and Instructional Technology

Technology Use for Learning, Thinking and Assessment Purposes

Keywords: Assessment Methods, Computer-assisted Learning, Educational Technologies, Engagement, In-service Teachers, Large-scale Assessment, Problem Solving, Quantitative Methods, Secondary Education, Teacher Effectiveness
Interest group: SIG 01 - Assessment and Evaluation, SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Maria A. Flores, University of Minho, Portugal

BYOD and technology use in class: Does it really have an impact?
Keywords: Computer-assisted Learning, Large-scale Assessment, Quantitative Methods, Secondary Education
Presenting Author: Maria-Luisa Schmitz, University of Zurich, Institute of Education, Switzerland; **Co-Author:**Chiara Antonietti, University of Zurich, Institute of Education, Switzerland; **Co-Author:**Tessa Consoli, University of Zurich, Institute of Education, Switzerland; **Co-Author:**Alberto Cattaneo, Swiss Federal University for Vocational Education and Training, Switzerland; **Co-Author:**Philipp Gonon, University of Zurich, Institute of Education, Switzerland; **Co-Author:**Dominik Petko, University of Zurich, Switzerland

Although Bring-Your-Own-Device (BYOD) is a widespread approach in upper-secondary schools with many potential advantages, studies on the actual effects of BYOD on digital classroom practices are scarce. The present study aims to examine the effects of BYOD on the frequency of students` technology use in class. In particular, we examine the effects of an official BYOD program, the number of years this official program has been in place, and the number of students indicating that they use their own devices during lessons. In addition, we investigated the influence of teachers` attitudes toward digital technologies ("will"), of their skills in teaching with digital technologies ("skill"), and of their perceived quality of the schools` infrastructure ("tool") on the frequency of students` technology use in class. Multilevel structural equation modeling (MSEM) analyses show that all three aspects of BYOD (official program, years, and percentage of students using their own device) have a significant and positive impact on the frequency of students' technology use in class. Moreover, only will- and skill- but not tool-scores significantly predict the dependent variable. As one of the first larger survey studies, we could show that BYOD has an actual influence on digital practices in class. Furthermore, the study indicates that in a high-tech country like Switzerland, teachers` beliefs and skills are more important for technology use in class than the technical equipment of a school.

Personalized Learning with Digital Technologies – A mixed-methods study in secondary schools
Keywords: Computer-assisted Learning, Educational Technologies, In-service Teachers, Teacher Effectiveness
Presenting Author: Regina Schmid, Schwyz University of Teacher Education, Switzerland; **Co-Author:**Christine Pauli, University of Fribourg, Switzerland; **Co-Author:**Rita Stebler, University of Zurich (retired), Switzerland; **Co-Author:**Dominik Petko, University of Zurich, Switzerland

Various schools have been changing their culture of teaching and learning towards personalized learning, and often used digital technologies for support. However, there is a lack of research on how digital technologies are used in schools with personalized learning approaches and how this use relates to quality

features of instruction. As the concept of personalized learning is multilayered and no common definition exists, our study relies on two theoretical dimensions ("Student-centered teaching methods"; "students' choice and voice") to investigate the relationship between technology-supported personalized learning and students' perceived instructional quality. For this purpose, we analyzed survey data of 8th grade students (N = 860) from 31 Swiss schools that have implemented personalized learning and use digital technologies. In addition, based on this data, we selected three schools with the most frequent use of digital technologies, to investigate how teachers implement digital technologies to facilitate and promote personalized learning. Results of the quantitative analysis show that student-centered teaching methods in the context of technology-supported personalized learning stimulate the cognitive activation of the students, and the supportive climate increases slightly with a higher degree of students' voice and choice on the computer. Our qualitative analyses resulted in three different case descriptions in terms of how schools integrate digital technologies into their daily practices. All cases indicate that there is still a lot of potential to support personalized learning through the use of digital technologies.

How do test-takers rate their effort? A comparative analysis of self-report and log file data
Keywords: Assessment Methods, Educational Technologies, Engagement, Problem Solving
Presenting Author:Róbert Csányi, SZTE, Hungary; **Co-Author:**Gyöngyvér Molnár, University of Szeged, MTA-SZTE Digital Learning Technologies Research Group, Hungary

Students' cognitive test performance is not only determined by their actual knowledge and skills, but can be strongly influenced by various affective factors, including partial or total lack of test-taking effort (Wise et al., 2014). The aim of the research is twofold: (1) to comparatively analyse the methods of measuring test-taking effort, and (2) to identify and characterise the profiles of students that can be distinguished on the basis of test-taking behaviour.The research sample consisted of first-year university students (N=1748). Computer-based data collection was carried out using the eDia platform and students were presented with interactive problems that required no prior knowledge. Students' test-taking effort was measured in two ways: (1) by a self-report questionnaire, and (2) by analysing log data (time spent on tasks, number of clicks). We applied k-means cluster analysis, that was successfully used in previous research on test-taking behavior (Goldhammer et al., 2017; Lundgren & Eklöf, 2020). The students' test-taking effort was consistent with their overall test performance. This correlation proved to be weaker based on the self-reported questionnaire data (r = .110) than on their actual test-taking behavior (r = .371). Both the self-report questionnaire and the log data showed a decrease in test-taking effort during the test. Based on the k-means cluster analyses, three groups of students were identified: (1) low effort, (2) high ability with medium effort, and (3) low ability with high effort. Results suggest that self-report questionnaire data are not consistent with students' actual test-taking behavior.

Session L 20

25 August 2023 08:00 - 09:30
UOM_A08
Single Paper
Higher Education

Motivational Beliefs and Strategies in Higher Education

Keywords: Achievement, Assessment Methods, At-risk Students, Attitudes and Beliefs, Burnout, E-learning/ Online Learning, Engagement, Higher Education, Motivation, Quantitative Methods, Self-regulated Learning and Behaviour
Interest group: SIG 04 - Higher Education
Chairperson: Armin Jentsch, University of Oslo, Norway

Does frustration of students' needs matter in relation to burnout and engagement?
Keywords: At-risk Students, Burnout, Engagement, Higher Education
Presenting Author: Piermarco Consiglio, University of Groningen, Netherlands; **Co-Author:**Joke Fleer, University of Groningen, Netherlands; **Co-Author:**Ellen Jansen, University of Groningen, Netherlands; **Co-Author:**Marjon Fokkens-Bruinsma, University of Groningen, Netherlands

Burnout is generally considered one of the causes of student dropout. On the contrary, engagement increases student academic performance. Previous research assessed the relationship between satisfaction of the basic psychological needs for autonomy, competence, relatedness and engagement and burnout. However, it remains unclear if university students' frustration of the three needs is related to engagement, primary and secondary symptoms of burnout. Based on the Self-Determination Theory, this work aims to assess the association between the frustration of the basic psychological needs for autonomy competence, relatedness and engagement, primary and secondary symptoms of burnout. Three multiple hierarchical regressions in a sample of 459 university students revealed that need for relatedness is not as crucial as the need for autonomy and competence in predicting student primary burnout symptoms and engagement. Yet, all three psychological needs were associated with the secondary symptoms of burnout. The abstract concludes with directions for future research and the implications of our findings. Keywords: University students; Frustration of basic psychological needs; Burnout; Engagement

Developing and validating a measure for the perceived civic and vocational relevance of studies
Keywords: Assessment Methods, Attitudes and Beliefs, Higher Education, Motivation
Presenting Author: Jonas Breetzke, University of Hamburg, Germany; **Co-Author:**Derya Özbagci, University of Hamburg, Germany; **Co-Author:**Carla Bohndick, University of Hamburg, Germany

In recent years, both the vocational and the civic relevance of higher education programmes have developed into guiding principles of most higher education institutions. Additionally, both factors are vital for study motivation, as most students want a degree program associated with good opportunities in the labour market and a positive impact on society. Despite its importance for both higher education institutions and students, there is a clear lack of validated scales that assess the perceived relevance of higher education studies. To address this, the present study describes the development and validation of two scales measuring how higher education students perceive the vocational and civic relevance of their studies. The scales were developed and validated in three independent studies with a total of N = 1.610 participants. We examined a) the factor structure of the scales, b) their measurement invariance across gender and study subject, c) their correlation with educational outcomes, and d) their development across the semester. Results of the confirmatory factor analyses support the postulated factor structure. Both scales show good reliability, strong measurement invariance across gender and study subject and were stable over the course of a semester. Correlations of both scales with different educational outcomes were in line with prior research and, thus, established further evidence for a valid interpretation of the scales. Different applications in and implications for research on students perceived relevance studies are discussed.

Longitudinal associations between intrinsic study motivation and achievement at university
Keywords: Achievement, Higher Education, Motivation, Quantitative Methods
Presenting Author: Laura Aglaia Sophia Messerer, University of Mannheim, Germany; **Co-Author:**Ronny Scherer, University of Oslo, Norway; **Co-Author:**Stefan Janke, University of Mannheim, Germany

A lack of (intrinsic) study motivation and difficulties to perform well are typically considered the major causes for students to drop out of higher education. However, research on the longitudinal interplay between these two factors is lacking—especially in the context of higher education. The effects in both directions seem plausible: Intrinsic study motivation may affect performance, because motivated students try harder and invest more time. Nevertheless, performance could also affect intrinsic study motivation, because students who perform well may develop a sense of competence, which is in turn crucial for the development of intrinsic study motivation. It is our aim to provide new insights into the temporal associations between intrinsic study motivation and achievement. To achieve this, we conducted a longitudinal study with six time points covering the full duration of a bachelor program for 1349 undergraduate students. Using a random-intercept cross-lagged panel model, we found strong, stable, and positive relations between intrinsic study motivation and study grades on the inter-individual (between) level. Moreover, we found some evidence for temporal trends on the intra-individual (within) level, as intrinsic study motivation was predictive for a positive development in study performance at subsequent time points. This trend emerged within later semesters (but not in the

freshmen year), indicating that an early development of stable intrinsic study motivation may make students more resilient to the challenges they face during their later years at university.

(Help me to) motivate me: Promoting motivation and motivational regulation in higher education
Keywords: E-learning/ Online Learning, Higher Education, Motivation, Self-regulated Learning and Behaviour
Presenting Author: Sophie von der Mülbe, University of Augsburg, Germany; **Co-Author:**Markus Dresel, University of Augsburg, Germany

Declining motivation to study is a widespread phenomenon among students in higher education, which can have serious consequences for study performance and can often be attributed to a lack of self-regulation of motivation. Because of high dropout rates in the STEM field, a training program combining direct promotion of motivation with promotion of motivational regulation was developed and tested for its effectiveness with STEM students. In addition to proximal effects on expectancy, value, and the use of motivational regulation strategies, distal effects on procrastination, study satisfaction, and dropout intentions were intended. Pretest and posttest data were assessed from 62 students of which 37 were randomly assigned to the training group and participated in nine digital, approximately 30-minute training sessions over the course of the semester. The remaining 25 students were assigned to the control group. For the subjective value of studying, the use of motivational regulation strategies and study satisfaction, the intended training effects proved to be statistically significant. For expectancy of success, procrastination, and dropout intentions, no training effects could be statistically verified. Overall, the results provide evidence that the training has at least partially the intended effects. This indicates that a training that combines direct promotion of motivation with promotion of self-regulation of motivation could be a fundamentally worthwhile approach.

Session L 21

25 August 2023 08:00 - 09:30
AUTH_T202
Single Paper
Assessment and Evaluation, Teaching and Teacher Education

Teacher Agency

Keywords: In-service Teachers, Inquiry Learning, Pre-service Teachers, Qualitative Methods, Quantitative Methods, Resilience, School Leadership, Self-concept, Self-regulated Learning and Behaviour, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development
Chairperson: Liyuan E, University of Helsinki, Finland

Early career teachers' professional agency and associations with leadership vision and school size
Keywords: In-service Teachers, School Leadership, Self-regulated Learning and Behaviour, Teacher Professional Development
Presenting Author: Liyuan E, University of Helsinki, Finland; **Co-Author:**Auli Toom, University of Helsinki, Finland; **Co-Author:**Jenni Sullanmaa, Tampere University, Finland; **Co-Author:**Janne Pietarinen, University of Eastern Finland, Finland; **Co-Author:**Tiina Soini-Ikonen, Tampere University, Finland; **Co-Author:**Kirsi Pyhältö, University of Helsinki, Finland

Professional agency plays a crucial role in teachers' professional development, pedagogical innovation, constructing professional identity, and promoting school improvement. Early career teachers' professional agency in the classroom consists of motivation to continuously learn, self-efficacy beliefs for learning, and intentional activities to facilitate and manage learning. This study explores the relationship between early career teachers' professional agency in the classroom, their perceived leadership vision, and school size. A total of 779 Chinese early career teachers, including primary and junior secondary school teachers, completed the questionnaire and the data were analyzed by using structural equation modelling (SEM). The results showed that early career teachers' perception of leadership vision contributes to their sense of professional agency in the classroom. The findings also revealed that school size was related to early career teachers' professional agency in the classroom. This implies that it is important to foster the development of school leadership for promoting early career teachers' active learning in the classroom.

Supporting Teacher Agency During a Collaborative Inquiry-based In-service Teacher Education Course
Keywords: In-service Teachers, Inquiry Learning, Quantitative Methods, Teacher Professional Development
Presenting Author:Äli Leijen, University of Tartu, Estonia; **Co-Author:**Margus Pedaste, University of Tartu, Estonia; **Co-Author:**Liina Lepp, University of Tartu, Estonia

Teacher agency has been explored in many studies in different contexts, however research on supporting agency is somewhat limited. In this study, we aimed to support teacher agency in a collaborative inquiry-based in-service course developed based on the ecological model of teacher agency and earlier empirical studies. We conducted a study among 57 course participants to explore the potential impact of the course on participants' agency and investigated which role the motives to join the course had on participants' agency dynamics. Data were collected with questionnaires from 40 participants. The results showed that participants' agency was supported to some degree during the collaborative inquiry-based in-service training course, teachers' motives to join the course were somewhat related to professional agency dynamics.

Unpacking Relationships Among Teacher Agency, Attribution, and Resilience in an Age of Neoliberalism
Keywords: In-service Teachers, Qualitative Methods, Resilience, Self-concept
Presenting Author: Ji Hong, University of Arizona, United States; **Co-Author:**Dionne Cross Francis, University of North Carolina at Chapel Hill, United States; **Co-Author:**Kelly Chong, Round Rock Children's Therapy Center, United States; **Co-Author:**Laura Lewis, University of Oklahoma, United States; **Co-Author:**Alex Parsons, Salt Lake City School District, United States; **Co-Author:**Crystal Recknagel, J.J. Pearce High School, United States; **Co-Author:**Qian Wang, University of Oklahoma, United States

Despite the growing research on teacher resilience, the ways teachers develop and enact resilience as they manage work-related challenges are understudied. As the effects of neoliberalism seep into schooling, the extent to which teachers believe they can exercise agency to change problematic situations is central to the way they cope with or manage challenges. This study unpacks the relationship between teacher resilience and agency by showcasing teachers from two schools. Although both schools faced significant challenges, these challenges, as well as the coping mechanisms employed, varied across the two schools. We observed that the challenges varied in duration and intensity, and teachers' levels of resilience were associated with their attributional beliefs, which influenced their sense of agentic control. This study shows the role of teachers' attribution beliefs and agency in the ways teachers exercise resilience and how they manage or fail to manage these challenges.

A questionnaire for assessing teacher agency across pre-service and in-service context
Keywords: In-service Teachers, Pre-service Teachers, Quantitative Methods, Teacher Professional Development
Presenting Author:Äli Leijen, University of Tartu, Estonia; **Co-Author:**Margus Pedaste, University of Tartu, Estonia; **Co-Author:**Aleksander Baucal, University of Belgrade, Serbia

Teacher agency is considered a key characteristic describing teacher professional competence; however, there are only limited questionnaires currently available for studying teacher agency. In our study we followed the ecological model of teacher agency and developed a questionnaire that allows to differentiate eight dimensions of agency. Three to four questions were formulated for each dimension in two domains: planning of teaching and learning activities, using information and communication technologies (ICT) in teaching. Data was collected electronically from 354 teachers (76 – pre-service, 278 – in-service) in Estonia. Confirmatory factor analysis showed acceptable fit of the eight factor model in two different domains where teachers often make decisions – planning of teaching and learning activities and using information and communication technologies in teaching. Comparison of configural, metric, and scalar models revealed good invariance of the model across the groups of pre-service and in-service teachers. Therefore, the new questionnaire seems to be suitable and sensitive for monitoring teacher agency throughout teacher career.

Session L 22

25 August 2023 08:00 - 09:30
UOM_A11
Single Paper
Culture, Morality, Religion and Education, Learning and Social Interaction, Motivational, Social and Affective Processes

Migrant and Refugee Students: Achievement, Social and Motivational Aspects

Keywords: Achievement, Attitudes and Beliefs, Cultural Diversity in School, Educational Policy, Emotion and Affect, Large-scale Assessment, Migrant / Refugee and Minority students, Multicultural Education, Parents' Beliefs and Affect, Primary Education, Secondary Education, Social Aspects of Learning and Teaching
Interest group: SIG 13 - Moral and Democratic Education, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Denis Dumas, University of Georgia, United States

School Diversity Models and Relations with Achievement: Does the Domain Matter?
Keywords: Achievement, Migrant / Refugee and Minority students, Multicultural Education, Primary Education
Presenting Author: Roy Konings, KU Leuven (BE), Belgium; **Co-Author:**Orhan Agirdag, KU Leuven / University of Amsterdam, Belgium; **Co-Author:**Jozefien De Leersnyder, KU Leuven / University of Amsterdam, Belgium

Research shows that how schools deal with ethnic-cultural diversity, or the School Diversity Model (SDM) they adopt, is important for students' achievement. For instance, schools could try to reduce (assimilationism), ignore (color-blindness) or embrace diversity (pluralism). However, it is not yet clear whether one and the same approach to diversity may be differently related to achievement depending on the domain in which that approach is applied, such as whether the approach is applied to dealing with linguistic, religious or curricular diversity, or more generally to dealing with diversity in pupils' identities. Therefore, in this study we focus on how the *domain-specific* perceptions of SDMs among 10-12 year old primary school students in Flanders are related to their achievement on a standardized mathematics test. We find that assimilationism is mostly unrelated to achievement across domains, whereas for color-blindness and pluralism it strongly depends on the domain in which the SDM is applied. Particularly paying attention to critical consciousness and the colonial history in the curriculum, as well as paying attention to color-blindness in the curriculum (but not in the linguistic domain) were beneficial for achievement scores.

Sense of belonging of children with and without a migration background in Austria
Keywords: Large-scale Assessment, Migrant / Refugee and Minority students, Primary Education, Social Aspects of Learning and Teaching
Presenting Author: Saranda Shabanhaxhaj, University of Graz, Institute of Education Research and Teacher Education, Austria; **Co-Author:**Heike Wendt, University of Graz, Austria

Respectful interaction is not only the basis for the learning environment, but also for living together in democratic society. Especially for children with a migration background, positive social and respectful relationships are the basis for political socialisation and engagement (Teuscher & Makarova, 2018; Ziemes, 2022). Therefore, the focus of this paper is to identify differences in the sense of belonging of children with and without a migration background in order to gain additional understanding of the students' experience of social relationships. The theoretical framework is mapped using the self-determination theory (Ryan & Deci, 2017). For this purpose, data from the TIMSS study 2019 (Schwippert et al., 2020) are regression analysed using the IEA IDB Analyser. The results show that, on average, students with a migrant background report significantly more frequent a low sense of belonging. Furthermore, it also shows that primary school pupils with a migration background perform better when they feel a high sense of belonging which emphasises the relevance of educational integration work.

Emotion Differentiation Ability & School Belonging among Flemish Multilingual and Monolingual Pupils
Keywords: Cultural Diversity in School, Educational Policy, Emotion and Affect, Migrant / Refugee and Minority students
Presenting Author: Graziela N.M. Dekeyser, KU Leuven (BE), Belgium; **Co-Author:**Orhan Agirdag, KU Leuven / University of Amsterdam, Belgium; **Co-Author:**Jozefien De Leersnyder, KU Leuven (BE), Belgium

In Flanders, significant gaps in sense of school belonging (SSB) exist between majority monolingual Dutch-speaking and minority multilingual pupils speaking Dutch as well as a non-Dutch heritage language (HL). In this study, we investigate the role of emotional competence in explaining these SSB differences. Although multilingual children are expected to have a multilingual advantage in emotional competence and thus SSB, we hypothesize that whether or not this multilingual advantage materializes may critically depend on children's language proficiency profile and the language policy of the school. Multilevel linear regressions are used to investigate our hypotheses among a sample of over 3000 pupils (aged 10 to 12) across 59 schools in Flanders. Preliminary analyses show that emotional competence significantly contributes to pupils' SSB. However, multilingual children do not outperform monolingual children in emotional competence. Moderated mediations of language policy and language proficiency profiles are to be further explored.

Immigrant-Origin Youths' Aspirations – a Cross-National Analysis Comparing the U.S. and Switzerland
Keywords: Attitudes and Beliefs, Cultural Diversity in School, Parents' Beliefs and Affect, Secondary Education
Presenting Author: Anita Caduff, University of California, San Diego, United States

Research has established that student aspirations are associated with educational outcomes. However, a nuanced understanding of how experiences and opportunities inform middle school students' professional aspirations has not yet been established. This examination is particularly interesting for immigrant-origin middle school students as research has shown that they often have higher ambitions than their non-immigrant peers. This cross-national study examines immigrant-origin adolescents' descriptions of why they pursue a specific profession in California (U.S.) and the canton of Bern (Switzerland). Thirty-eight hours of semi-structured interview data with 22 immigrant-origin students were qualitatively analyzed and cross-nationally compared. The findings show how the context of reception, parents, role models, strengths, challenges, and interests, shape immigrant-origin youths' aspirations. Implications for practice are discussed.

Session L 23

25 August 2023 08:00 - 09:30
UOM_GYM
Roundtable
Learning and Instructional Technology

Learning and Instructional Technologies

Keywords: Artificial Intelligence, Bullying, Digital Literacy and Learning, E-learning/ Online Learning, Educational Technologies, Ethics, Game-based Learning, Higher Education, Inclusive Education, Learning Analytics, Learning Strategies, Multimedia Learning, Primary Education, Teacher Professional Development
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Daniel Deimel, University of Duisburg-Essen, Germany

Study-Buddy: An educational chatbot for study advice on effective learning strategies
Keywords: Artificial Intelligence, Educational Technologies, Higher Education, Learning Strategies
Presenting Author: Tim Debets, Open Universiteit, Department of Online Learning and Instruction, Netherlands; **Co-Author:**Martijn van Otterlo, Open Universiteit, Netherlands; **Co-Author:**Tanja Vos, Open Universiteit, Netherlands; **Co-Author:**Desirée Joosten-ten Brinke, Open University of the Netherlands, Netherlands; **Co-Author:**Gino Camp, Open Universiteit, Department of Online Learning and Instruction, Netherlands

During the last decades, research in Educational Sciences has shown that students find it difficult to evaluate the effectiveness of their learning strategies. Self-

study is an important aspect of any educational program and research in cognitive and educational sciences has rendered a good understanding of which study strategies work and which do not. To help students adopt these effective learning strategies instantly, and in a personalized manner, an educational chatbot will be developed. An intelligent chatbot can maintain a conversation with a user, answer questions and respond intelligently. The goal of this chatbot is to advise particular learning strategies based on context (e.g., the student's study program)and dialogue history. To improve the quality of the chatbot, prior dialogues in combination with techniques from the Artificial Intelligence subfield reinforcement learning will be utilized to train the chatbot. Hereafter, the chatbot can decide at each step in the dialogue what the next utterance should be, given the context of the user and the dialogue history. During the roundtable, the advisory aspects of the chatbot will be the centre of attention, what should this advice look like? How do wemeasure the effectiveness of the advice? These and similar questions willbe the main points of discussion.

Evaluating Elementary Student Experiences from Digital Safety Immersion Summer Camp
Keywords: Bullying, Educational Technologies, Ethics, Primary Education
Presenting Author: Florence Martin, North Carolina State University, United States; **Co-Author:**Doreen Mushi, North Carolina State University, United States; **Co-Author:**Julie Bacak, University of North Carolina Charlotte, United States; **Co-Author:**Weichao Wang, University of North Carolina Charlotte, United States

With the increase in technology use by elementary school students, it has become important for them to be educated on digital safety. This study examined learner's knowledge and experiences from participating in a digital safety immersion camp on digital identity and digital footprint, cyberbullying, netiquette and responsible online behavior and digital security and privacy. In addition, data on areas that they will change regarding digital safety, and aspects that they enjoyed the most during the camp were analyzed. Sixty of the 89 elementary school students for whom their parents provided consent to include the evaluation data for research completed the pre- and posttest assessments. The average score on the pretest was 10.93 and on the posttest was 13.43 out of 14 showing a statistically significant increase. Fifty-nine students completed the post camp evaluation survey with all four items rated above 3.4 on a scale of 4.0. Students indicated that the camp taught them how to interact safely and protect their private information online. Students had mentioned various aspects in cyberbullying, digital identity and digital footprint, digital privacy and security, and netiquette and responsible online behavior as areas that they would change. Students enjoyed the various digital safety topics but also mentioned the hands-on project using Pixton, and the instructors and the guest speakers. The findings from this study has implications for school administrators, teachers, technology specialists, parents, and students on the importance of digital safety education.

EU-FairPlay: Educational Equity and Digital Game-Based Learning. Current state of research.
Keywords: E-learning/ Online Learning, Game-based Learning, Inclusive Education, Multimedia Learning
Presenting Author: Zhitian Zhang, Hector Research Institute of Education Sciences and Psychology, University of Tübingen, Germany; **Presenting Author:**Markus Suren, TU Chemnitz, Germany; **Co-Author:**Helge Fischer, TU Dresden, Germany; **Co-Author:**Katerina Tsarava, University of Tübingen, Germany; **Co-Author:**Martina Seemann, TU Chemnitz, Germany; **Co-Author:**Richard Joos, TU Dresden, Germany

"EU-FairPlay" is a network project, currently consisting of seven international partner universities from different European countries and a core organization team from three German universities (University of Tübingen, Dresden University of Technology, Chemnitz University of Technology). The project's goal is to strengthen educational research and practice in the context of Digital Game-Based Learning (DGBL) with a special focus on educational equity. We aim to achieve our goal by bringing together national and international experts from the fields of Educational Technologies, Game Research, and Educational Research. Going forward, we plan regular network meetings and collaborations to generate relevant research output. One method that we are planning to use is Delphi (Scheibe et al., 1975). The aim of the Delphi study is to initiate a consensus-building process among multi-disciplinary experts, in order to identify the important topics and issues regarding DGBL and educational equity. With a three-round Delphi study, we will identify the top priority of the issue in discussion and reach a consensus among experts, leading to experts' group opinions and decisions. As a part of our open research framework practice, the submitted roundtable session in Thessaloniki offers a great opportunity for a more discursive exploration of our findings. In the roundtable session, participants will be invited to contribute to a discussion of the Delphi study output, add further remarks and facilitate consolidating all Delphi rounds' results and findings.

Identifying teachers' needs whilst working with a teacher dashboard: an explorative study
Keywords: Digital Literacy and Learning, Educational Technologies, Learning Analytics, Teacher Professional Development
Presenting Author: Manel van Kessel, Leiden University, Netherlands; **Co-Author:**Nadira Saab, Leiden University, Netherlands; **Co-Author:**Inge Molenaar, Radboud Universiteit Nijmegen, Netherlands

Teacher dashboards visually display information about students, provided to teachers who may use this information to improve their teaching. An example of this information is students' progress on different tasks during a specific lesson. The use of these teacher dashboards is increasing in primary education. This study aims to better understand the forms of enactment and actions a teacher shows when working with a dashboard before, during and after giving a lesson, and the needs of teachers for effective dashboard use. We expect that complex characteristics, skills and knowledge may be directly related to dashboard use. In order to understand the needs of teachers, we collected data in the form of a logbook, to investigate if and how teachers use a dashboard whilst preparing a lesson. The lesson was observed, and the enactment was coded. An in-depth interview was conducted to better understand the needs of teachers, whilst working with a dashboard and to get an insight into how teachers make use of a dashboard after the lesson. The results from this study can be used to optimize the professionalization of teachers for effective dashboard use. In this Round Table session, we discuss which aspects participants of this session think are also important when effectively implementing a teacher dashboard, besides the earlier mentioned basic and complex characteristics.

Session L 24

25 August 2023 08:00 - 09:30
UOM_A05
ICT Demonstration
Lifelong Learning

Hybrid Human-AI Driven Personalized Education Tool

Keywords: Artificial Intelligence, Computer-assisted Learning, E-learning/ Online Learning, Lifelong Learning
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Please bring your own device if you are attending this ICT demonstration.Lack of personalization in learning is among the most important issues in the current educational systems. Learning is a personal process that depends on the learners' individual goals (e.g. desired jobs, skills, knowledge), context (e.g. where do they live?), and preferences (e.g. what are their preferred languages or content formats). Therefore, inclusive educational resources, which cover different needs, are required in offering high-quality personalized educational services. In this regard, open and free educational resources can play a role as they are created continuously by people around the world with different languages, preferences, levels of expertise, etc.Although open and free educational resources are extremely useful in offering high-quality learning environments, challenges such as lack of automatic and intelligent quality control processes and property (e.g. title, description, subject) extraction, which are required in building educational services (e.g., search and recommendations) limit the use of these educational resources.Therefore, we have designed an intelligent platform to utilize (open and free) educational resources for lifelong learners receiving personalized learning recommendations. To do this, we developed an open online learning recommender system with two main responsibilities. One component is responsible for the quality assurance of curricula by a hybrid, Human-AI content co-curation mechanism. The second responsibility is offering curated educational resources to the learners through a personalized learning dashboard. On this dashboard, with the help of AI, course and educational resource recommendations are used toward individual learning objectives and contexts.

Hybrid Human-AI Driven Personalized Education Tool
Presenting Author: Mohammadreza Molavi Hajiagha, Technical Information Library (TIB), Germany; **Co-Author:**Mohammadreza Tavakoli, German National LIbrary for Science and Technology (TIB), Germany; **Co-Author:**Gábor Kismihók, Leibniz Information Centre for Science and Technology, Germany

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educational systems. Learning is a personal process that depends on the learners' individual goals (e.g. desired jobs, skills, knowledge), context (e.g. where do they live?), and preferences (e.g. what are their preferred languages or content formats). Therefore, inclusive educational resources, which cover different needs, are required in offering high-quality personalized educational services. In this regard, open and free educational resources can play a role as they are created continuously by people around the world with different languages, preferences, levels of expertise, etc.Although open and free educational resources are extremely useful in offering high-quality learning environments, challenges such as lack of automatic and intelligent quality control processes and property (e.g. title, description, subject) extraction, which are required in building educational services (e.g., search and recommendations) limit the use of these educational resources.Therefore, we have designed an intelligent platform to utilize (open and free) educational resources for lifelong learners receiving personalized learning recommendations. To do this, we developed an open online learning recommender system with two main responsibilities. One component is responsible for the quality assurance of curricula by a hybrid, Human-AI content co-curation mechanism. The second responsibility is offering curated educational resources to the learners through a personalized learning dashboard. On this dashboard, with the help of AI, course and educational resource recommendations are used toward individual learning objectives and contexts.

Session L 25

25 August 2023 08:00 - 09:30
UOM_A06
ICT Demonstration
Assessment and Evaluation

An R-Based Application to Code Texts Semi-Automatically

Keywords: Assessment Methods, Educational Technologies, Quantitative Methods, Writing/Literacy
Interest group: SIG 01 - Assessment and Evaluation

Please bring your own device if you are attending this ICT demonstration.In this ICT demonstration, I will present an application for semi-automatic coding of text responses. The presentation will begin by explaining the theory and method behind the app (reference blinded for review), and then outline simulation results using different datasets.The app comes as an R-based package and will be presented through detailed hands-on activities. No scripting or programming knowledge is necessary to follow along, as the app provides a graphical R-Shiny user interface. The software makes it possible to manually code a complete data set while being supported by an automatic coding assistant. The assistant, which implements the method, helps the human rater by automatically coding certain responses in the background, lightening the manual coding load. Thus, the assistant saves considerable work and costs. The process is based on word vector representations in a semantic space. Accordingly, responses are represented as vectors, which are subsequently clustered. The assistant explores the clusters systematically and presents responses to the human rater for manual coding. After each manual coding step, the coding assistant estimates the distribution of the remaining responses in the cluster. Suppose, under consideration of statistical confidence, that the cluster can be assumed homogeneous and contains similar responses to the ones coded manually. In this case, those responses are automatically assigned the majority label of manually coded responses. In simulations, depending on the item, manual labor was reduced by 52% on average while keeping miscodings at only 3% on average.

An R-Based Application to Code Texts Semi-Automatically
Presenting Author: Nico Andersen, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Fabian Zehner, German Institute for International Educational Research (DIPF), Centre for International Student Assessment (ZIB), Germany

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Session L 26

25 August 2023 08:00 - 09:30
UOM_A09
ICT Demonstration
Learning and Instructional Technology

Meet Nearpod: A game-changing tool for student engagement

Keywords: Computer-assisted Learning, E-learning/ Online Learning, Educational Technologies, Game-based Learning
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Please bring your own device if you are attending this ICT demonstration.In this hands-on, interactive techno-pedagogical demonstration, we will explore *Nearpod*, a teacher-friendly digital platform used in schools and higher education in face-to-face, remote and hybrid learning contexts. I will show how educators at all levels can benefit from a variety of tools for alternative assessment in synchronous and asynchronous lessons. Participants will experience the use of interactive slides, games and collaborative activities, which encourage active learning and engagement for all students. In addition to presenting the tool and its pedagogical possibilities, I will present data from a recent study on pedagogy of care in online settings. Students describe the ways in which *Nearpod* enhanced their engagement and learning during COVID-19 and discuss how the tool motivated them and connected them to the lecturer and course content.

Meet Nearpod: A game-changing tool for student engagement
Presenting Author: Nikki Aharonian, Oranim College of Education, Israel

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Keynotes 1

25 August 2023 09:45 - 11:15
AUTH_CH

Keynote
Learning and Social Interaction

On the necessity of major and minor synvändor in the educational sciences

Keywords: Critical Thinking, Educational Policy, Social Aspects of Learning and Teaching, Social Interaction
Interest group: SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Roger Saljo, University of Gothenburg, Sweden

On the necessity of major and minor synvändor in the educational sciences:UN-learning to RE-learn for epistemic-sustainabilityThis keynote aims to contribute to a re-thinking, un-learning and re-learning space that looks at some core ideas and assumptions related to contemporary societal and planetary concerns, including concerns within the research enterprise. Beyond offering an invitation to pause and re-think, this keynote interrogates universalizing vocabularies that fixate our ways of thinking and working in educational practices, including how our scholarship risks becoming complicit in re-cycling and re-creating reductionistic ideas that loop back into educational practices. My overarching argument aligns with an emergent call within research and higher education for going beyond its universalizing monolithic ethos.Marked through the concept synvändor and using a mobile gaze, I draw attention to the need for shifting perspectives in major and minor ways in research and educational work across K-12 and higher education. These synvändor are needed for epistemic-sustainability so that scholarship in areas of relevance to contemporary schooling and teacher-education – such as, communication, culture and diversity – can move beyond ethnocentrically framed biases and connect with challenges of our times. Troubling key taken-for-granted universalizing truths and using the areas of Language Sciences and Identity research as illustrative points of departure, I raise concerns about the outsourcing of important educational agendas to concepts that build on contentious assumptions. It is this default outsourcing that is troubled through a curiosity-driven multiversal and global-centric mobile gaze wherein both northern and southern knowledge-regimes are privileged.In contrast to universalizing hegemonies, global-centric scholarship enables multiversal framings that can contribute to epistemic-sustainability both in educational practices and in how research is produced and consumed. Providing hope, multiversality enables shifting research challenges and societal crisis towards epistemic-sustainability. The ideas presented in this keynote are based on my engagement with both north-centric and south-centric scholarship, including fieldwork and writings in and across northern and southern territories. Explicitly multi/inter/cross/trans-disciplinary, this work is relevant to epistemic-sustainability given its non-allegiance to mono-disciplinarity.

On the necessity of major and minor synvändor in the educational sciences
Presenting Author: Sangeeta Bagga-Gupta, Jönköping University, Sweden

On the necessity of major and minor synvändor in the educational sciences:UN-learning to RE-learn for epistemic-sustainabilityThis keynote aims to contribute to a re-thinking, un-learning and re-learning space that looks at some core ideas and assumptions related to contemporary societal and planetary concerns, including concerns within the research enterprise. Beyond offering an invitation to pause and re-think, this keynote interrogates universalizing vocabularies that fixate our ways of thinking and working in educational practices, including how our scholarship risks becoming complicit in re-cycling and re-creating reductionistic ideas that loop back into educational practices. My overarching argument aligns with an emergent call within research and higher education for going beyond its universalizing monolithic ethos.Marked through the concept synvändor and using a mobile gaze, I draw attention to the need for shifting perspectives in major and minor ways in research and educational work across K-12 and higher education. These synvändor are needed for epistemic-sustainability so that scholarship in areas of relevance to contemporary schooling and teacher-education – such as, communication, culture and diversity – can move beyond ethnocentrically framed biases and connect with challenges of our times. Troubling key taken-for-granted universalizing truths and using the areas of Language Sciences and Identity research as illustrative points of departure, I raise concerns about the outsourcing of important educational agendas to concepts that build on contentious assumptions. It is this default outsourcing that is troubled through a curiosity-driven multiversal and global-centric mobile gaze wherein both northern and southern knowledge-regimes are privileged.In contrast to universalizing hegemonies, global-centric scholarship enables multiversal framings that can contribute to epistemic-sustainability both in educational practices and in how research is produced and consumed. Providing hope, multiversality enables shifting research challenges and societal crisis towards epistemic-sustainability. The ideas presented in this keynote are based on my engagement with both north-centric and south-centric scholarship, including fieldwork and writings in and across northern and southern territories. Explicitly multi/inter/cross/trans-disciplinary, this work is relevant to epistemic-sustainability given its non-allegiance to mono-disciplinarity.

Keynotes 2

25 August 2023 09:45 - 11:15
HELEXPO_CC
Keynote
Learning and Social Interaction

Dealing with Disagreement: Coming to Terms with the Social Nature of Knowledge

Keywords: Inquiry Learning, Reasoning, Social Aspects of Learning and Teaching, Social Interaction
Interest group:
Chairperson: Raija Hämäläinen, University of Jyväskylä, Finland

In contemporary networked societies, the controversial nature of knowledge is increasingly in the public eye. When learners go online, they often encounter conflicting knowledge claims about scientific issues, current events, historical events, and more. Sometimes the experts are also in disagreement. Reasonably responding to such disagreements is vital for making wise personal and social decisions. But how can learners make sense of disagreements when their own knowledge of the disputed issues is limited? And how can they reconcile the conflicting perspectives of diverse epistemic authorities? In this talk, we will argue that disagreements in the public sphere are both a pressing educational challenge and a valuable opportunity for developing learners' understanding of the social nature of knowledge, including their own positions as knowers.First, we will present a framework that addresses how learners make sense of disagreements by understanding the nature and causes of the disagreement, evaluating competing sources and claims and, where possible, resolving the disagreement. We will also present empirical findings for each of these components and some of their reciprocal relations. This analysis can extend to understanding expert disagreement as well as disagreement more broadly. Second, we will discuss recent research efforts to foster learners' competence to reason about disagreements. Drawing on insights from these studies, we will illustrate emergent design principles and scaffolds for promoting productive engagement with disagreements. To conclude, we will present open challenges, such as identifying false controversies and understanding how expert consensus develops despite ongoing uncertainties. Learning to deal with disagreements, we propose, is an opportunity for grasping how knowledge is socially constructed through processes of debate and consensus formation, and how learners can manage their dependence on knowledgeable others in times of uncertainty.

Dealing with Disagreement: Coming to Terms with the Social Nature of Knowledge
Presenting Author: Sarit Barzilai, University of Haifa, Israel; **Presenting Author:**Eva Thomm, University of Erfurt, Germany

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reason about disagreements. Drawing on insights from these studies, we will illustrate emergent design principles and scaffolds for promoting productive engagement with disagreements. To conclude, we will present open challenges, such as identifying false controversies and understanding how expert consensus develops despite ongoing uncertainties. Learning to deal with disagreements, we propose, is an opportunity for grasping how knowledge is socially constructed through processes of debate and consensus formation, and how learners can manage their dependence on knowledgeable others in times of uncertainty.

Keynotes 3

25 August 2023 09:45 - 11:15
UOM_CH
Keynote

Consciousness as a compass for navigating learning in uncertain times

Keywords: Curriculum Development, Educational Neuroscience, Metacognition, Self-efficacy
Interest group:
Chairperson: Maria Platsidou, Greece

Understanding consciousness as an awareness of the mind´s processes and content, this presentation has two main aims. First, to present a theoretical model of the development of consciousness. Based on theories and empirical evidence from developmental psychology and neuroscience, this model supports the argument that Theory of Mind and Metacognition are intertwined core elements of consciousness. We also argue that Theory of Mind and Metacognition are enhanced by underlying mechanisms, such as the efficiency and/or efficacy of executive functions (working memory, attention control and flexibility). Second, to present findings from recent studies conducted in our laboratory, showing that in different developmental phases (infancy, early and late childhood, and adolescence) different facets of consciousness and different aspects of executive functions exert a prominent role in learning. They, thus, differentially influence school performance at successive educational levels. Overall, these results point to the need to develop new curricula and teaching methods aligned to the students' abilities but also enabling individualization of teaching according to the possibilities of each individual student. It is proposed that this alignment between the development of consciousness and educational curricula is important if we are to fully capitalize on students' abilities and available skills, and, hence, foster their ability to meet the demands of a continuously changing society in times of uncertainty.

Consciousness as a compass for navigating learning in uncertain times
Presenting Author:NIKOLAOS MAKRIS, Democritus University of Thrace, Greece

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Session M 1

25 August 2023 12:00 - 13:30
UOM_CH
Invited Symposium
Learning and Social Interaction

Different Perspectives on Momentary Situated Engagement in Classroom Contexts

Keywords: At-risk Students, Classroom Management, Cooperative/Collaborative Learning, Educational Policy, Emotion and Affect, Engagement, Interest, Motivation, Peer Interaction, Primary Education, Problem Solving, Science Education, Social Interaction
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Raven Rinas, Augsburg University, Germany
Organiser: Ricardo Böheim, Technical University of Munich, Germany
Organiser: Jennifer Symonds, University College Dublin, Ireland
Discussant: Anastasia/Natassa Kyriakopoulou, Greece

This symposium brings together research from different disciplines (including self-regulation, motivation, conceptual change, social interaction) to promote cross-disciplinary discussions about the complex process of students' momentary situated engagement in classroom contexts. The four presentations in this symposium reflect contributions from the EARLI funded Integrated Model of Momentary Learning in Context (IMMoLIC) Emerging Field Group. Students' engagement can be studied across different grain sizes ranging from the microlevel (e.g., child learning in the moment) to the macrolevel (e.g., group of children in the class or school); Recently however, there has been a strong call for more fine-grained analyses of student learning. Integrating research from different disciplinary perspectives on students' momentary engagement holds great potential for exploring the context and conditions under which students engage in academic tasks, for identifying what keeps them engaged, and for understanding why their engagement may change from one moment to the next. To measure engagement at different momentary levels, two of the contributions use classroom observations, one contribution analyzes data from online discussions and the final contribution collects self-reported data from experience sampling. Results draw attention to the important role of context (such as class size, peer relations or group dynamics) and the relevance of individual learner characteristics (such as emotions and attitudes) that need to be considered in the process of students' momentary learning in classroom contexts. The discussant will comment on the benefits of integrating different theories and research areas to enhance our understanding of students' momentary situated engagement in classroom contexts.

Optimal Learning Moments in Finnish and US Science Classrooms: A Network Analysis Approach
Presenting Author: Xin Tang, Shanghai Jiao Tong University, China; **Co-Author:**I-Chien Chen, Michigan State University, United States; **Co-Author:**Jari Lavonen, University of Helsinki, Finland; **Co-Author:**Barbara Schneider, Michigan State University, United States; **Co-Author:**Joseph Krajcik, Michigan State University, United States; **Co-Author:**Katariina Salmela-Aro, Helsinki University, Finland

Optimal learning moments (OLM), or being also named as situational engagement (e.g., J. Inkinen et al., 2019), refer to the experienced engagement of an activity that an individual feels interested, be challenged and capable to finish it (Schneider et al., 2016). The present study examined the emotional and motivational correlates of OLM by using the co-occurrence network analysis and by including data: Finland and US. Both samples were from high schools and were measured using the experience sampling method in the science classrooms. The Finnish sample consisted of 282 students (age = 15-16) and the number was 533 for the US sample (age = 15-17). Co-occurrence network analysis showed that feelings of concentration, success, in control, and meeting self and others' expectation appeared frequently as a result of optimal learning moments. These results were highly consistent between Finnish and US science classrooms. However, when considering the mutual influence among the variables, country differences appeared. For Finnish students, optimal learning moments were mutually reinforced with the creative experiences and feelings of competitiveness and pride. In contrast, for US students, optimal learning

moments were closely with the attitudes towards science practices. In sum, this study enriched our understanding of optimal learning moments on its co-occurring experiences and on contextual differences.

Exploring Collaboration and Executive Functions in Open-Ended Problem-Solving in Mathematics
Presenting Author:K. Ann Renninger, Swarthmore College, United States; **Co-Author:**Ricardo Böheim, Technical University of Munich, Germany; **Co-Author:**Maria Consuelo De Dios, Swarthmore College, United States; **Co-Author:**Maeve R. Hogan, Swarthmore College, United States; **Co-Author:**Moe Htet Kyaw, Swarthmore College, United States; **Co-Author:**Ana G. Michels, Swarthmore College, United States; **Co-Author:**Marina Nakayama, Swarthmore College, United States; **Co-Author:**Pablo E. Torres, University of Cambridge, United Kingdom; **Co-Author:**Helena Werneck de Souza Dias, Swarthmore College, United States

Although momentary engagement has been studied at different levels of granularity, missing is an articulation of the similarities and differences between moments and how representative one moment is of another. In this study, we explore the cognitive and the behavioral engagement of two groups of urban middle school students during the math-related moments of their problem solving in the online Virtual Math Teams (VMT) environment. We used a fine-grained, moment-to-moment analysis to describe the process of students' learning during group work (RQ1) and how their executive functions and collaborative problem solving (CPS) unfolded from moment to moment (RQ2). We found that there were no significant differences in the relative proportion of each phase of problem solving (exploring, constructing, checking) they engaged, and that the students were more likely to engage in discussions when exploring or checking, than when they were constructing. Differences in the two groups' CPS appeared to inform the type of problem solving engaged, but may not, at least by the final session, result in different levels of achievement. To the best of our knowledge, this study is among the first to detail students' cognitive and behavioral engagement in open-ended problem solving. That moment to moment differences were documented, along with similar levels of achievement at the time of the final problems session, extends previous research by pointing to the individual, and equally productive, pathways that may characterize group work. Replication of these findings and study of groups which vary in interest is needed.

Class Size, Momentary Behavioural Engagement, and Low Income Schools: An Irish National Study
Presenting Author: Jennifer Symonds, University College Dublin, Ireland; **Co-Author:**Aisling Davies, University College Dublin, Ireland; **Co-Author:**Seaneen Sloan, University College Dublin, Ireland; **Co-Author:**Dympna Devine, University College Dublin, Ireland; **Co-Author:**Gabriella Martinez Sainz, University College Dublin, Ireland; **Co-Author:**Ricardo Böheim, Technical University of Munich, Germany; **Co-Author:**Matt Somerville, IOE, UCL's Faculty of Education and Society, United Kingdom; **Co-Author:**Edward Baines, UCL Institute of Education, London, United Kingdom; **Co-Author:**Xin Tang, Shanghai Jiao Tong University, China; **Co-Author:**Niamh Oeri, University of Bern, Switzerland; **Co-Author:**Raven Rinas, Augsburg University, Germany; **Co-Author:**Florian Bühler, University of Bern, Switzerland; **Co-Author:**Gertraud Benke, Klagenfurt University, Austria

This study used systematic observation to test whether children's momentary behavioural engagement was poorer in larger classes, and whether this relationship was impacted by being in a low income school receiving government supports. Data were collected with 632 children (50.5% female) in 121 classrooms in 92 schools recruited into the Children's School Lives nationally representative cohort study of Irish primary schooling. The Observational and Research Classroom Learning Evaluation (ORACLE) systematic observation tool was used to observe individual children's behaviour at 30-seconds intervals across a five minute period in ordinary lessons of English, mathematics, science or Irish. Multilevel mediation analysis tested for the impact of class size and DEIS schooling on ten forms of momentary behavioural engagement and disengagement at the classroom level controlling for children's age, gender, ability, family affluence, and migrant status at the individual level. Results indicated that engagement was more frequent in smaller classes and disengagement was more frequent in larger classes. Being in a low income school receiving government supports promoted less behavioural disengagement, and this association was mediated by smaller classes in low income schools.

Peer Relations, Engagement and Achievement in Primary School Classrooms
Presenting Author: Edward Baines, UCL Institute of Education, London, United Kingdom; **Co-Author:**Matt Somerville, IOE, UCL's Faculty of Education and Society, United Kingdom; **Co-Author:**Ricardo Böheim, Technical University of Munich, Germany; **Co-Author:**Yue Zhao, University College London, United Kingdom; **Co-Author:**Jennifer Symonds, University College Dublin, Ireland; **Co-Author:**Aisling Davies, University College Dublin, Ireland; **Co-Author:**Peter Blatchford, UCL Institute of Education, United Kingdom

Previous research suggests connections between peer relationships as expressed both inside and outside of the classroom and children's engagement and learning within the classroom. However only a few studies have explored these connections in detail or considered the possible processes that may begin to explain connections. This study sought to collect systematic data from pupils within primary school classrooms that would help clarify the role of peers in classroom engagement and learning. This multi-method study involved the use of peer-sociometric questionnaires to provide measures of in-class peer relations, informal peer relations such as acceptance and friendships, and social network variables. Self-report questionnaire data provided data on school engagement and disengagement and disaffection. Science attainment data were collected at the start and end of the year. Data on these measures were collected from over 500 pupils based in English primary schools. A subsample of pupils were also observed in class in terms of their momentary behavioural engagement during individual, pupil-pupil and whole class working and were rated by their teachers in terms of their attention and behaviour in class. Findings show moderate associations between multi-method measures of momentary and classroom engagement and small associations between peer relations measures, multiple measures of school and classroom engagement and attainment. Multiple regressions, controlling for class and school level variables, were conducted to examine peer relations measures relative to school/classroom engagement and learning outcomes. Findings are discussed in relation to previous research and theory, focusing on the complex inter-connections between measures and explanatory mechanisms.

Session M 2

25 August 2023 12:00 - 13:30
AUTH_CH
Invited Symposium

Social network tools: Advanced methods to contextualize learning research

Keywords: Achievement, Feedback, Higher Education, Informal Learning, Migrant / Refugee and Minority students, Mixed-method Research, Peer Interaction, Primary Education, Qualitative Methods, Quantitative Methods, Secondary Education, Self-efficacy, Social Aspects of Learning and Teaching, Social Interaction, Tool Development
Interest group: SIG 17 - Methods in Learning Research
Chairperson: Laura Thomas, Ghent University, Belgium
Chairperson: Sylvia Gabel, Universität Augsburg, Germany
Organiser: Jasperina Brouwer, University of Groningen, Netherlands
Discussant: Hanke Korpershoek, University of Groningen, Netherlands

As the overarching conference theme suggests, education is a beacon of hope in the uncertain times we are currently experiencing. The learning of all involved stakeholders in education is particularly hopeful and can help us take on the current societal challenges. This symposium centres around the social nature of learning. Consistent with the aims of SIG 17 to further knowledge on methods in learning research, several scholars present their research on social network methods within the field of learning and education. Together, the presentations show that the social network approach enables an analysis of learning as a social phenomenon. As such, social network studies are increasingly important for informing educational practice and theory formation. The four contributions from Belgium, Germany, the United Kingdom, and the Netherlands present various applications of social network research in different contexts within education or the workplace. Our SIG celebrates its 20th anniversary and invites you to celebrate this with us while discussing the added value of social network tools for learning research based on these contributions.

The social network of teachers guiding newly arrived migrant students: A qualitative study

Presenting Author: Laura Thomas, Ghent University, Belgium; **Co-Author:**Britt Adams, Ghent University, Belgium; **Co-Author:**Melissa Tuytens, University of Ghent, Belgium; **Co-Author:**Ruben Vanderlinde, Ghent University, Belgium

Due to the rapidly increasing number of NAMS, dealing with a growing cultural, linguistic, and socio-economic diversity has become a daily reality in education. While the need for interculturally competent teachers is regularly expressed, many teachers feel inadequately prepared to respond to ethnically diverse classrooms after completing formal teacher training. From a social network perspective, we can assume that the relationships teachers have with actors both inside and outside the school context may include information, advice and support helpful in teaching in multicultural classrooms. The current study maps Flemish primary and secondary school teachers' social networks in relation to supporting NAMS and focuses on both the actors called upon by teachers and the support flowing through the ties between the focal teachers and their colleagues. For this, semi-structured interviews and qualitative social network analysis are conducted. During the conference, the results as well as implications for practice and policy – both local and internationally – are discussed.

The development of peer support networks, self-efficacy, and drop-out intentions
Presenting Author: Julia Eberle, Ruhr-Universität Bochum, Germany; **Co-Author:**Jasperina Brouwer, University of Groningen, Netherlands

The transition from school to higher education is a crucial and challenging step for students. Academic as well as social adjustment is required. On the one hand, experiencing failure during the transition may reduce students' self-efficacy and increase their drop-out intentions. On the other hand, successfully building a peer support network may help cope with academic challenges on the emotional and informational levels. This study aims at investigating the relation between the development of first-year students' social support networks on the informational and emotional level, and the development of their self-efficacy and drop-out intentions. In a longitudinal survey with four-time points over the course of their first semester, a cohort of B. A student is observed regarding the development of their peer networks and psychometric variables. Preliminary results show a significant decrease in self-efficacy and a significant increase in drop-out intentions over time. Both peer networks show a descriptive decrease over the course of the semester with the emotional support network being bigger. These analyses will be followed up by coevolution analyses.

Analysing teacher agency within school social structure: New uses of visual methods
Presenting Author: Natasa Pantic, University of Edinburgh, United Kingdom; **Co-Author:**Marc Sarazin, University of Edinburgh, United Kingdom; **Co-Author:**Thibault Coppe, University of Groningen, Netherlands

Teacher agency has undergone much investigation in recent years. The recognition that teachers are embedded in social networks in schools, which affect teachers' work, has led to calls to jointly analyse teachers' relational agency—teachers' capacity to reach out to others to solve problems—and the social structures that teachers are embedded in. However, disentangling structure and agency is notoriously difficult, both methodologically and conceptually. In the current paper, we present an approach that allows researchers to analyse—and visualise—teachers' relational agency *within* social structure. The approach adapts research tools originally developed to support teachers' reflections, and to visualise the evolution of social networks, to enable a mixed methods social network analysis of structure and agency. It consists in collecting quantitative data on teachers' social networks and qualitative data on concrete cases of teachers exercising their relational agency to support students, and mapping these latter cases onto network visualisations—specifically, onto the network ties involved in each concrete case. This quantitatively-enhanced qualitative analysis, we argue, can be extended to longitudinal and multi-site analyses, and be supplemented by additional qualitative and quantitative work, to produce further insights on the complex relation between structure and agency. Ultimately, we argue, the approach could even be used with other populations entirely (beyond teachers in schools).

A social network perspective on workplace learning and social capital formation in a medical team
Presenting Author: Jasperina Brouwer, University of Groningen, Netherlands; **Co-Author:**Bram Jacobs, University of Groningen, Netherlands

Workplace-based learning (WBL) occurs as informal learning through daily clinical practice. Doctors mobilize their social capital in terms of making use of the resources embedded in the team network. Although previous research emphasized that WBL is a social dynamic phenomenon, studies from a longitudinal social network perspective in a medical team are scarce. Therefore, we address the following research questions: To whom do doctors easily provide feedback and whom do they approach when they want to share personal information? This may depend on self-efficacy, years of experience, and hours of employment. Our findings based on stochastic actor-oriented modelling (SAOM) show that doctors provide more easily feedback when they have a personal and work-related advice relationship with someone. The more experienced the doctor is, the more easily he or she provides feedback and someone is less likely to be provided with feedback when someone is more self-officious. Sharing personal information depends on providing feedback and asking for work-related advice. A homophily effect exists for sharing personal information in terms of gender, and employment contract hours. Someone is less likely to be approached for sharing personal information when someone tends to be autonomous.

Session M 3

25 August 2023 12:00 - 13:30
HELEXPO_CC
Invited Symposium
Teaching and Teacher Education

Building a Better Understanding of Teachers' Well-Being

Keywords: Anxiety and Stress, Burnout, Developmental Processes, Educational Technologies, Emotion and Affect, In-service Teachers, School Leadership, Simulation-based Learning, Teacher Effectiveness, Teacher Efficacy, Well-being
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Robert Klassen, University of York, United Kingdom
Chairperson: Sophie Thompson-Lee, University of York, United Kingdom
Discussant: Courtney Bell, United States

Our EARLI Centre for Excellence is focused on understanding personal and environmental factors that lead to effective teachers and teaching. However, research that explores the factors contributing to "good teachers" may overlook some of the costs associated with the drive to increase teacher effectiveness. Teacher shortages, high attrition rates, and the high incidence of stress-related illnesses lead us to consider the role of mental health and well-being in teacher effectiveness. In this symposium we present four perspectives on teachers' well-being. First, Klusman et al. provide a developmental perspective from a 10-year longitudinal study on teachers' well-being in Germany. Opfer and Steiner present findings comparing the well-being of a large, nationally representative sample of US teachers with other working adults. Bardach et al. studied preservice teachers in a virtual reality teaching environment in order to test the links between teacher characteristics and stress. Finally, Dehne and colleagues present findings from two studies that explore the role that school principals play in teachers' well-being and burnout in the Netherlands. Our discussant, Courtney Bell, will integrate the findings from the four papers and highlight commonalities and differences, areas for further research, and implications for research and practice.

The long-term trajectories of teachers' well-being: Results from a 10 year longitudinal study
Presenting Author: Uta Dr. Klusmann, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**Thamar Voss, University of Freiburg, Germany; **Co-Author:**Dirk Richter, University of Potsdam, Germany; **Co-Author:**Mareike Kunter, German Institute for International Educational Research (DIPF), Germany

Teachers' occupational well-being is highly relevant for job turnover and professional performance. Therefore, many studies have focused on describing predictors of teacher well-being. However, few studies can describe the development of well-being over a long time and identify risk factors early in the career. In the present study, we draw on data from 250 teachers from their first teaching year to 10 years later. The study includes four measurement points and an additional dairy study. We first describe the developmental trajectories of teachers' emotional exhaustion and job satisfaction. Second, we examined whether symptoms of early stress experience, personality, and self-efficacy can predict teachers' professional well-being after a decade. Our longitudinal analysis

revealed an increase in the mean level of emotional exhaustion and stability in beginning teachers' job satisfaction. Moreover, beginning teachers' early stress experiences predicted teachers' emotional exhaustion ten years later.

Using a Nationally Representative Survey to Understand Post-Pandemic U.S. Teacher Well-Being
Presenting Author:V. Darleen Opfer, RAND Corporation, United States; **Co-Author:**Elizabeth Steiner, RAND, United States

In this paper, we present findings from the 2022 State of the American Teacher (SoT) surveys. These findings are related to teacher well-being, working conditions, and intentions to leave their jobs. We fielded surveys to a nationally representative sample of K–12 teachers. The survey was conducted in January 2022, when K–12 public schools were providing instruction in person and when the omicron variant caused COVID-19 case rates to spike throughout the country. The SoT survey yielded 2,360 complete responses out of 4,400 eligible invitations, for a 54-percent completion rate. The SoT survey was oversampled to allow for nationally representative estimates of teachers who identify as people of color. The SoT was weighted to ensure national representation. To compare teachers' reports with those of the general working adult population, we fielded nearly identical survey questions about well-being, working conditions, and respondents' intentions to leave their current job to a nationally representative sample of working adults in the United States.We found:· Teachers reported worse well-being than other working adults.· Well-being was especially poor among Hispanic/Latinx teachers, mid-career teachers, and female teachers.· Teachers of color reported sources of job-related stress that were similar to those of White teachers but were more likely to experience racial discrimination.· Poor well-being and adverse working conditions were associated with teachers' intentions to leave their jobs, while supportive school environments were linked to better well-being and a decreased likelihood of intentions to leave.

Revisiting Effects of Teacher Characteristics on Stress: A Virtual Reality Study
Presenting Author: Lisa Bardach, University of Tübingen, Germany; **Co-Author:**Yizhen Huang, University of Potsdam, Germany; **Co-Author:**Eric Richter, University of Potsdam, Germany; **Co-Author:**Robert Klassen, University of York, United Kingdom; **Co-Author:**Thilo Kleickmann, Kiel University, Germany; **Co-Author:**Dirk Richter, University of Potsdam, Germany

Identifying personal characteristics that make teachers less prone to experiencing stress is a longstanding research goal with important implications for educational practice. The present work revisited effects of cognitive (intelligence) and non-cognitive (neuroticism, classroom management self-efficacy) teacher characteristics on stress in two studies with German student teachers. We capitalized on a virtual reality (VR) classroom setting, allowing to combine experimental control and authentic teaching situations. In the VR classroom, the level of disruptive behaviors of the (virtual) students was experimentally manipulated, with lower levels of disruptions in Study 1 (lower complexity/less stressful teaching experience) than in Study 2 (higher complexity/more stressful teaching experience). We focused on stress in terms of psychological (i.e., self-reported) stress assessed after the experiments as well as physiological stress (heart rate). In both studies neuroticism positively predicted psychological stress. Classroom management self-efficacy and intelligence were not significantly related to psychological stress. None of the cognitive and non-cognitive characteristics significantly predicted physiological stress. Overall, this work contributes to the current knowledge on teacher characteristics and points towards the promise of adopting a personality psychology perspective to research on stress in challenging teaching situations.

Under Pressure: The Role of the Principal-Teacher Relationship in Teachers' Well-Being
Presenting Author: Mathias Dehne, Friedrich Schiller University Jena, Germany; **Co-Author:**Debora Roorda, University of Amsterdam, Netherlands; **Co-Author:**Helma Koomen, Research Institute of Child Development and Education, Netherlands; **Co-Author:**Marjolein Zee, Erasmus University Rotterdam, Netherlands

The present era of concurrent crises poses challenges to the teaching profession. Providing resources to increase teachers' ability to cope with work pressure therefore seems crucial to finding and retaining qualified teachers amid a lingering shortage and protecting them against burnout. A plethora of studies suggests that school principals' more general behaviors, actions, and interaction styles play a key role in teachers' well–being at work. However, to date, studies have not examined the role of affective principal–teacher relationships (PTRs) at the dyad level. This presentation provides the results of two cross-sectional studies (Study 1: n = 363 primary school teachers; Study 2: n = 419 secondary school teachers), in which we investigated whether PTRs mediated or moderated the association between work pressure and well–being. Teachers reported about their work pressure, well–being, and the degree of closeness and conflict in the relationship with their principal. In both studies, we found evidence for partial mediation for the association of Work Pressure with Emotional Exhaustion and Depersonalization. In study 1, the association between Work Pressure and Personal Accomplishment was fully mediated by Closeness. No evidence was found for the moderating role of PTRs. In sum, the two studies suggest that positive PTRs can act as a protective factor against teacher burnout. In contrast, negative relationships can exacerbate teacher well–being. Future avenues of research for PTRs in terms of theoretical and practical implications will be discussed.

Session M 4

25 August 2023 12:00 - 13:30
AUTH_DC2
Symposium
Teaching and Teacher Education

Perspectives on Emerging Teacher Learning Research

Keywords: Communities of Learners and/or Practice, Computer-supported Collaborative Learning, Dialogic Pedagogy, In-service Teachers, Learning Approaches, Science Education, Social Aspects of Learning and Teaching, Teacher Efficacy, Teacher Professional Development, Teaching Approaches, Teaching/Instructional Strategies, Tool Development
Interest group:
Chairperson: Susan Yoon, University of Pennsylvania, United States
Discussant: Susan Goldman, University of Illinois at Chicago, United States

Over the past decade, student achievement standards increasingly emphasize knowledge and skills that require pedagogies other than transmission models (Pellegrino & Hilton, 2012; OECD 2021, 2019). Research converges on the importance of students achieving deep understanding of concepts, principles, and practices of traditional and emerging disciplinary content areas. Achieving deep learning requires that students engage in developmentally appropriate forms of authentic disciplinary practices, and that they do so in interaction with others (e.g., Dillenbourg, et al., 2009; Goldman et al. 2016; Danish & Gresalfi, 2018). Facilitating such learning processes changes what teachers teach, but how they teach it, and requires adaptation to in-the-moment interactions of teachers and students. Flexible application of knowledge and practices implies that teachers need to understand what to do, how to do it, and why to do it (e.g., Bereiter, 2014; Brown & Campione, 1995; Darling-Hammond & Bransford, 2007; Zech et al., 2000). Professional learning experiences need to support teachers in confronting these challenges of engaging students in complex problem solving in traditional and emerging disciplines using instructional approaches that address diverse learning needs. The four presentations in this symposium reflect contributions to a recently published volume (September, 2022) on emerging teacher learning research. Three of the presentations address new professional learning experiences that address the pedagogies and knowledge that teachers need; the fourth reports on collaborative design as professional learning and its unique affordances for teacher learning. The discussant will comment on emerging research themes for teacher learning theory and practice.

Engaging teachers in dialogic discourse: PD effectiveness and teachers' individual learning
Presenting Author: Ricardo Böheim, Technical University of Munich, Germany; **Co-Author:**Ann-Kathrin Schindler, University of Augsburg, Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany

In dialogic discourse students are seen as active learners who collaboratively construct knowledge through the open exchange of different ideas and perspectives. However, classroom discourse is usually dominated by the teacher while students give short and specific answers that are expected to align with the prespecified flow of instruction. To help teachers shift their discourse practice towards a more dialogic pedagogy, we designed a one-year professional development (PD) program. Nineteen teachers and their 450 high-school students participated in this study. Teachers were videotaped to track their individual

learning trajectories. Video ratings revealed that teachers' discourse practice varied substantially among teachers when entering the program and while some teachers showed considerable changes in their discourse practice other teachers did not show any change during PD participation. Evaluation results suggest that teachers' practice changes were related to changes in student learning. Specifically, students whose teachers changed their discourse practice toward a more dialogic pedagogy perceived stronger increases in their perceived activation, their cognitive engagement and motivation. This study demonstrates that PD is a powerful tool to foster change in teachers' discourse practice and that changes in discourse practice are related to changes in students' learning perceptions. Our results call for more adaptive and customized PD programs that acknowledge teachers' individual learning trajectories and account for teachers' prior experience with the targeted practice.

The Role of Data Analytics Tools for Teachers Learning to Implement Student Collaboration
Presenting Author: Nikol Rummel, Ruhr University Bochum, Germany; **Co-Author:**Anouschka van Leeuwen, Utrecht University, Netherlands

We conceptualize data analytics tools as an additional source for teacher learning in the context of monitoring and supporting student collaboration in the classroom. We discuss what those tools offer teachers and what new types of learning it takes from teachers to use data analytics tools. The first perspective we describe concerns tools that offer data about student activities in order to support teacher learning regarding monitoring of students. The second perspective concerns the development of tools that offer data about teachers themselves, which they may use them to learn about and adjust their own behavior in supporting student collaboration.

Investigating co-design as a professional development model to support teacher efficacy
Presenting Author: Eleni Kyza, Cyprus University of Technology, Cyprus; **Co-Author:**Andria Agesilaou, Cyprus University of Technology, Cyprus; **Co-Author:**Yiannis Georgiou, Cyprus University of Technology, Cyprus; **Co-Author:**Andreas Hadjichambis, Ministry of Education, Culture, Sports and Youth, Cyprus

Many arguments have been voiced in favor of establishing teacher-researcher collaborations in the context of Teacher Professional Development (TPD) and curriculum reform. This study draws from a longitudinal co-design effort with in-service science teachers, and reports data from the process of co-design, and the classroom implementations of the co-design outcomes, to discuss these as contexts for supporting teachers as "transformative intellectuals". We view co-design with teachers as a fertile setting for unsettling established educational practices of passive teaching and learning, in support of moving towards critical praxis and a transformative approach to one's own teaching. This study draws from the second cycle of a TPD which included 27 in-service, science education teachers at the elementary, middle, and high school level, working in disciplinary co-design teams, each guided by a university researcher. The co-design teams developed inquiry modules that integrated Responsible Research and Innovation (RRI) ideas, which advocate a more dynamic and inclusive relationship between scientific advancements and societal involvement. Through qualitative and quantitative analysis of the data, we report on how teachers' efficacy changed and how teachers reflected on their experiences in becoming "intellectual partners" in design. We conclude with a discussion of the role of co-design as a professional development approach to support teacher learning and professional growth.

Teachers' Adaptive Expertise and Impacts on Student Experiences During STEM-Integrated Learning
Presenting Author: Susan Yoon, University of Pennsylvania, United States; **Co-Author:**Amanda Cottone, University of Pennsylvania, United States; **Co-Author:**Jooeun Shim, University of Pennsylvania, United States; **Co-Author:**Chad Evans, University of Pennsylvania, United States; **Co-Author:**Kate Miller, University of Pennsylvania, United States; **Co-Author:**Noora Noushad, University of Pennsylvania, United States; **Co-Author:**Blanca Himes, University of Pennsylvania, United States

This study is motivated by a call for more STEM-integrated teaching and learning in K12 education. One critical issue that has emerged is how teachers will acquire the requisite expertise to accomplish this goal and how this impacts student classroom experiences. We worked with expert biology teachers in a summer professional development workshop and school-year implementation on the evolving topic of bioinformatics–a field that integrates biology, data literacy, and computational approaches. Through an adaptive expertise lens, we reveal challenges teachers faced in adapting STEM-integrated curricula in their practice due to a need for a deeper level grasp of content knowledge. We further investigate relationships between teachers' adaptive expertise measures and student classroom experience measures in five factors that represent learning in core bioinformatics concepts and skills. Our results show that teachers' levels of AE significantly influenced how students experienced the STEM-integrated curriculum in the classroom. We contend that more research is needed on how to support the development of teachers' STEM-integrated content knowledge.

Session M 5

25 August 2023 12:00 - 13:30
AUTH_T002
Symposium
Motivational, Social and Affective Processes

Enjoying cognitive effort: outcomes and development of Need for Cognition in youth

Keywords: Achievement, Cognitive Development, Developmental Processes, Engagement, Interest, Motivation, Personality, Secondary Education, Well-being
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Jeroen Lavrijsen, KU LEUVEN, Belgium
Discussant: Astrid Poorthuis, Utrecht University, Netherlands

Need for Cognition, as the tendency to seek, engage in, and enjoy effortful cognitive activity, is a key intellectual investment trait that guides how individuals invest their time and effort in their intellect. Whereas the construct has often been investigated in relation to the daily functioning of adults, this symposium examines the relevance of Need for Cognition for educational research and practice. The symposium offers a comprehensive evaluation of how Need for Cognition shapes the academic, motivational and emotional functioning of students. In addition, it considers which factors affect the development of Need for Cognition over time. In particular, the *first study* (N = 3,409; Grade 7; Belgium) examines the association between Need for Cognition and academic performance, controlling for cognitive ability, openness to experience and persistence. The *second study* (N = 1,069; Grades 5-7; Germany) investigates longitudinal associations between Need for Cognition and academic interest, to see whether Need for Cognition predicts changes in interest and whether interest affects the development of Need for Cognition. The *third study* (N = 1,546; 6-19 years; Germany) examines how Need for Cognition affects both the general and school-specific well-being of students. The *fourth study* (N = 3,355; Grades 7-9; Luxembourg) investigates how the development of Need for Cognition over time depends on the learning environment in different school tracks. An expert in educational psychology reflects on how these studies position Need for Cognition as a novel and important construct for educational research and practice.

Need for Cognition Predicts Academic Achievement Beyond Cognitive Ability, Openness and Persistence
Presenting Author: Jeroen Lavrijsen, KU Leuven, Belgium; **Co-Author:**Franzis Preckel, University of Trier, Germany; **Co-Author:**Karine Verschueren, KU Leuven, Belgium

The construct of Need for Cognition reflects individual differences in the tendency to seek, engage in, and enjoy effortful cognitive activities. This study scrutinized the role of Need for Cognition in academic achievement in a large sample of Flemish adolescents (n = 3,409; 49.6% boys; M_{age} = 12.4 years). Using CFA and linear regression models, findings revealed that Need for Cognition uniquely predicted student's academic performance, above and beyond three student characteristics conceptually and empirically related to Need for Cognition, that is, cognitive ability, openness to experience, and persistence. Moreover, two subdimensions of Need for Cognition, capturing students' eagerness to approach cognitive challenges and their preparedness to master them, were incrementally associated with academic performance. Further investigating interactive effects between Need for Cognition and cognitive ability, Need for Cognition was observed to predict school performance independent of ability.

Need for Cognition Predicts Changes in Academic Interest but not the Other Way Round

Presenting Author: Franzis Preckel, University of Trier, Germany; **Co-Author:**Vsevolod Scherrer, Universität Trier, Germany

The personality trait of need for cognition (NFC) describes an individual's tendency to engage in and enjoy thinking. Interest as a motivational variable refers to the psychological state of engaging or the predisposition to reengage with particular content over time. We investigated whether NFC predicts academic interest over time with and without controlling for students' academic achievement. Longitudinal data were collected from *N*=1069 high school students (40% female) in grades 5 to 7 using Rasch-scaled academic achievement tests in three domains (i.e. mathematics, German, English as foreign language), domain-specific interest scales, and a NFC questionnaire (3 to 4 waves of measurement). Autoregressive cross-lagged structural equation models were used for analyses. In all domains, changes in interest were positively predicted by NFC, whereas changes in NFC were not predicted by interest. Findings did not change substantially when controlling for academic achievement. The findings contribute to an increasing body of research supporting NFC as a relevant construct in school contexts.

Need for Cognition as a Resource for Coping with Everyday Challenges in School
Presenting Author: Johanna Bruchmann, Institute of Psychology, Faculty of Behavioural and Social Sciences, Chemnitz University of Technology, Germany; **Co-Author:**Alexander Strobel, Technische Universität Dresden, Germany; **Co-Author:**Antonia Martin, TU Chemnitz, Germany; **Co-Author:**Laura May Legler, TU Dresden, Germany; **Co-Author:**Anja Strobel, TU Chemnitz, Germany

Previous research results demonstrate that the investment trait Need for Cognition (NFC), i.e., the tendency to actively seek, engage in and enjoy effortful cognitive activity, is beneficial for learning behavior and consequently associated with better results in school and university. In our study we were particularly interested in the aspect of enjoying effortful cognitive activity. Current research demonstrates a relation between the joy of thinking and well-being as well as coping with not only intellectually demanding situations for students but also with challenges in everyday life. As everyday school life goes along with many challenges, we investigated how NFC could serve as a resource for general and school-specific well-being in children between 6 and 19 years. We collected survey data from 1546 children in central eastern Germany, stemming from six different schools. To account for the effects of variables already empirically proven to be influential, achievement motivation as well as academic self-concept were considered, too. First results show that higher NFC was associated with more joy of life (correlations between r_S = .21 and r_S = .32) especially in cognitively challenging school environments. Domain-specific correlations between NFC and well-being in school were between r_S = .32 and r_S = .60. Across all studies we found a substantial effect of NFC on school-specific well-being (r = .39) highlighting the potential of NFC as a resource for coping with demanding situations. Further results, ongoing research questions and limitations will be discussed during the presentation.

The Development of Need for Cognition: Longitudinal Differences across Secondary School Tracks
Presenting Author: Franzis Preckel, University of Trier, Germany; **Co-Author:**Joanne Colling, University of Luxembourg, Luxembourg; **Co-Author:**Rachel Wollschläger, University of Luxembourg, Luxembourg; **Co-Author:**Ulrich Keller, University of Luxembourg, Luxembourg; **Co-Author:**Antoine Fischbach, Luxembourg Centre for Educational Testing, Luxembourg

Need for Cognition (NFC), defined as an individual's tendency to engage in and enjoy thinking, receives increasing attention in educational psychological research focusing both on its relation to educational outcomes and its development. Whereas multiple studies identified NFC as an important construct accounting for individual differences in cognitive and academic variables (e.g., intelligence, academic achievement), knowledge about its development remains rather scarce. The present study therefore investigates how NFC develops longitudinally in a full cohort of 7th to 9th graders (N = 3.355, 50.1 % female) in Luxembourg, while focusing in particular on potential differences across school tracks as differential learning environments. Latent difference score models revealed a significant decrease in NFC in both the full cohort and across all school tracks with the decrease being largest in the highest and smallest in the intermediary track. Whereas no track difference was found for the lowest track, the decrease in NFC was significantly larger for highest track students than for intermediary track students (Cohen's d of 0.20). The identified track difference in the development of NFC remained significant when controlling for student background variables (gender, SES, language, and migration background). By generating solid knowledge on the development of NFC in a tracked secondary school system, the study is aiming at paving the way for more longitudinal research on how an individual's tendency to engage in and enjoy thinking develops, how it could be fostered and how existing inequalities across tracks could be reduced.

Session M 6

25 August 2023 12:00 - 13:30
UOM_CR
Symposium
Instructional Design, Learning and Social Interaction, Motivational, Social and Affective Processes

Homework: family involvement and teachers' role

Keywords: Achievement, Educational Attainment, Engagement, Motivation, Parental Involvement in Learning, Primary Education, Secondary Education, Self-regulated Learning and Behaviour, Teaching/Instructional Strategies
Interest group: SIG 06 - Instructional Design, SIG 10 - Social Interaction in Learning and Instruction, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Susana Rodriguez, Spain
Organiser: Lisa Benckwitz, IPN Leibniz Institute for Science Education, Germany
Organiser: Konstantina Falanga, Aristotle University of Thessaloniki, Greece
Organiser: Tania Vieites, Universidad de La Coruña, Spain
Organiser: Jianzhong Xu, United States
Discussant: Carolina Rodríguez Llorente, Universidad de La Coruña, Spain

Homework continues to be one of the most controversial school activities. Although we continue to find those who question its benefits, empirical evidence seems to confirm that homework serves to consolidate knowledge and improve skills and, ultimately, to achieve better performance (Cooper, Robinson & Patall, 2006)*.In this symposium we try to answer the following questions:How does parental help with homework relate to homework effort and time management and student achievement?How does parental involvement in homework affect academic motivation and performance?What conditions of homework prescription favor students' school engagement and self-regulation?How does homework assistance provided by private tutors relate to homework effort and time management and student performance?Two papers focus on parental involvement and help in homework. The contribution 1 (USA) explores how parental help with homework would be associated with homework effort, procrastination, and achievement. The contribution 2 (Greece) studies, from a longitudinal perspective, the association between parental involvement in homework, motivation and academic performance.The other two contributions deal with the prescription of quality homework and the homework assistance provided by private tutors. Developing a quasi-experimental research, presentation 3 (Spain) evaluates the effectiveness in terms of school engagement and self-regulation of a homework prescription method. Finally, opening a line of research on homework assistance by private tutors, presentation 4 (Germany) suggests that the characteristics of this assistance may determine its usefulness depending on age.All papers together underline the complexity of joining the efforts of agents such as parents and teachers to make homework a truly valuable educational resource.
*. https://doi.org/10.3102/00346543076001001

Homework assistance provided by private tutors and students' outcomes – Does students' age matter?
Presenting Author: Lisa Benckwitz, IPN Leibniz Institute for Science Education, Germany; **Co-Author:**Katharina Kohl, Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Natalia Suárez-Fernández, University of Oviedo, Spain; **Co-Author:**José Carlos Núñez Pérez, University of Oviedo, Spain; **Co-Author:**Karin Guill, Leibniz Institute for Science and Mathematics Education, Germany

Many students receive private tutoring and completing homework is one of the main instructional foci of private tutoring. However, only little is known about the quality of homework assistance provided by private tutors and its links with students' outcomes. Therefore, we adapted three quality dimensions from prior

research on parental homework assistance to the context of private tutoring, namely responsiveness, structure, and control. Prior research on parental homework assistance has shown that the quality dimensions are related with students' homework behaviour and academic achievement. Moreover, there is first evidence that these links might differ according to students' age. To address the lack of research on homework assistance given by a tutor, we investigated the relationships between the three quality dimensions and students' homework behaviour and achievement in three different age groups at the secondary level. We conducted multi-group analyses based on data from $N = 237$ students at different stages of secondary school. In the youngest age group (Grade 5 and 6) we did not find any significant links between the quality dimensions and students' outcomes. In the two older age groups, students' homework behaviour was positively predicted by structure (Grade 7 and 8), and negatively predicted by control (Grade 9).

Parent homework involvement,student motivation and performance:A person-centered longitudinal study
Presenting Author: Konstantina Falanga, Aristotle University of Thessaloniki, Greece; **Co-Author:**Eleftheria Gonida, Aristotle University of Thessaloniki, Greece; **Co-Author:**Dimitrios Stamovlasis, Aristotle University of Thessaloniki, Greece

Student motivation has been significantly associated with parental involvement in children's education. However, limited longitudinal research has been conducted to date on the relationships between parental homework involvement and children's motivational and academic functioning. The study aimed at investigating longitudinal associations between parental beliefs for the child and types of involvement in math homework (autonomy support, control, interference) and student motivational beliefs (achievement goals and efficacy beliefs) and academic performance via a person-centered approach. A sample of 296 5th and 6th graders completed twice a year self-reports measuring achievement goal orientations (mastery, performance-approach, performance-avoidance) and math self-efficacy, and solved mathematical tasks. Their parents completed questionnaires on their involvement in math homework and their beliefs for their child's efficacy in math. Latent class analysis indicated four profiles based on children's goal orientations and efficacy beliefs which were relatively stable across the four time points. Regarding longitudinal relationships, the following significant results were found: (i) the 'High Mastery' profile was negatively predicted by parental control in all four time points; (ii) the 'Low Mastery and Self-efficacy' profile was positively predicted by interference and negatively by parents' efficacy for the child in time points 2 and 3, respectively; (iii) the 'All High' profile was positively predicted by parental control in three time points; and (iv) math performance was positively associated with the 'Mastery' profile. Findings are discussed in light of current theory and evidence on parents' contribution in children's motivational and academic outcomes, and implications for practice will be pointed out.

MITCA: Homework Implementation Method improving student self-regulation and school engagement
Presenting Author: Tania Vieites, Universidad de La Coruña, Spain; **Co-Author:**Fátima María Díaz Freire, University of A Coruña, Spain; **Co-Author:**Lucía Díaz Pita, University of A Coruña, Spain; **Co-Author:**Susana Rodriguez, University of A Coruña, Spain; **Co-Author:**Antonio Valle Arias, University of A Coruña, Spain

In response to the controversy that still exists regarding the quantity, quality, and effectiveness of homework and after an extensive review of the available evidence about the prescription of quality homework, the MITCA Homework Implementation Method (Valle & Rodríguez, 2020) is designed. To evaluate the effectiveness of this method, an investigation with a quasi-experimental design, with a control group and pre and post measures is proposed. The effectiveness of the homework prescription method is estimated with the participation of a total of 43 teachers and 964 students in the 5th and 6th grades of Primary Education from 20 different schools in the Autonomous Community of Galicia(Spain). The results show differences between the students who participated in the implementation of MITCA and the students in the control group, not only in terms of their involvement in homework but also in relation to their school engagement and student self-regulation. The discussion and conclusions shed light on the object of study and allow us to support the efficacy of the MITCA method as an educational resource. This work sets out future lines of research on the topic of homework; its immediate educational implications for the prescription of quality homework.

Student-Perceived Parental Help with Homework: Identifying Student Profiles
Presenting Author: Carolina Rodríguez Llorente, Universidad de La Coruña, Spain; **Co-Author:**Ruiping Yuan, University of Mississippi, United States; **Co-Author:**Jianzhong Xu, Mississippi State University, United States

This study used a person-center approach to examine student-perceived parental help with homework according to the data from eighth graders. Measures on student-perceived parental help include (a) two measures relating to student-perceived quality of parental help (content support and autonomy support), and (b) one measure concerning student-perceived quantity of parental help. Latent profile analysis produced five different profiles regarding parental help with homework: *Low Perceived Help*, *Medium-Low Perceived Help*, *Predominantly Perceived Autonomy Support*, *Moderate Perceived Help*, and *High Perceived Help*. Furthermore, profile membership was related to homework effort, procrastination, and mathematics achievement after controlling for parent education and prior achievement, with approaching large to large effect sizes. Implications for future studies and educational practices are discussed in light of these findings

Session M 7

25 August 2023 12:00 - 13:30
UOM_A02
Symposium
Higher Education

Understanding students' perspectives on learning and instruction: A qualitative approach

Keywords: Attitudes and Beliefs, Higher Education, Instructional Design, Learning Strategies, Mixed-method Research, Motivation, Qualitative Methods, Student Drawings
Interest group: SIG 06 - Instructional Design, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Louise David, Maastricht University, Netherlands
Organiser: Felicitas Biwer, Maastricht University, Netherlands
Organiser: Marloes Broeren, Avans Hogeschool / Avans University of Applied Sciences, Netherlands
Organiser: Morane Stevens, KU Leuven - University of Leuven, Belgium
Discussant: Matthias Nückles, University of Freiburg, Germany

Many learners still struggle to study effectively during self-regulated learning, despite increasing efforts to instruct students how to do so. Especially, in the context of higher education, self-regulated learning is a key component since large portions of learning happen in an instructor-absent environment. To better support students' learning behaviors, it is crucial to understand their perspectives and beliefs on learning and instruction. Qualitative research methods offer a powerful tool to gain in-depth insights into learners' reflections on their behavior and understanding of instruction. This symposium aims to discuss insights into how students in higher education perceive instruction, how they study during their self-regulated learning, and what motivates them to use (in)effective learning strategies. The first contribution used drawings to map students' general and spontaneous views on instruction. The second contribution investigated perspectives of students, who have (not) experienced instruction, on effective learning strategies and how to use them during self-study via focus groups. The third contribution employed focus groups to explore how students typically study and how they experience changing their study habits. The fourth contribution investigated factors that influenced students' motivation to use effective learning strategies during their self-study using focus groups. The four contributions give in-depth insights into students' perspectives and beliefs toward learning and instruction in the context of higher education. Furthermore, they underline the importance of taking students' perspectives into account and the need to build on learners' behaviors and understandings when designing interventions to promote effective learning. Matthias Nückles will act as discussant.

Imagining education: An exploration of students' prototypical ideas of instruction
Presenting Author: Morane Stevens, KU Leuven - University of Leuven, Belgium; **Co-Author:**Jan Elen, KU Leuven, Belgium

This contribution points attention to students' understanding of instruction as a type of domain-independent prior knowledge. This so-called 'instructional knowledge' of students is assumed to have important implications for learning in educational settings. An attempt was made to map this construct by asking 91

students within a Flemish higher education institution to make a drawing representing their spontaneous views on instruction. A thematic analysis of these drawings revealed seven recurring themes. Findings support previous research demonstrating that students hold similar ideas about instruction, which are rather 'classic' in nature. Contrary to previous findings, it was also revealed that a fair amount of participants supplemented their drawings with new elements. This study contributes to understanding instructional knowledge and offers opportunities for further research.

How students apply learning strategies: A qualitative comparison between different strategy users
Presenting Author: Gabriel Taban, Fontys University of Applied Sciences, Netherlands; **Co-Author:**Felicitas Biwer, Maastricht University, Netherlands; **Co-Author:**Anique de Bruin, Maastricht University, Netherlands

While decades of research from cognitive psychology has provided insights into effective learning strategies for long-term learning, there is still a discrepancy between what research recommends and what students do. Past research has investigated the effect of separate training programs on students' knowledge and use of effective learning strategies, however, transition to their self-study remains difficult. As a more sustainable alternative for a separate training program, teachers can use effective principles of learning in their classes and make these explicit to their students. The effects of such a training on the intention and actual use of effective learning strategies are, however, unclear. In this study, we explored how first-year engineering students, who experienced such a training or not, prepare for their exams with a specific focus on desirably difficult learning strategies. Students completed a questionnaire about their knowledge about and use of effective learning strategies. In three focus group discussions with 18 students, we investigated students' perspective on effective learning strategies and about how they use these in the self-study context. Results show great variability between students' perceptions of learning and study goals, learning for the exam versus learning for the long-term, and provide insights into future intervention and teacher instructions.

Students' Habitual Use of Effective Learning Strategies
Presenting Author: Louise David, Maastricht University, Netherlands; **Co-Author:**Felicitas Biwer, Maastricht University, Netherlands; **Co-Author:**Rik Crutzen, Maastricht University, Netherlands; **Co-Author:**Anique de Bruin, Maastricht University, Netherlands

Habits drive a large portion of how we study and can either help or harm long-term academic achievement. More specifically, beneficial study habits relate to increased academic performance and lower motivational conflicts when studying. Nevertheless, many students struggle to form and maintain beneficial habits as they engage in less profitable ones. While the use of effective but effortful learning strategies is essential for academic achievement, students often habitually rely on ineffective learning strategies. Study habits could help students to incorporate these effective but effortful learning strategies consistently. To support students in breaking old, ineffective habits and forming new, effective study habits, we first need to understand what students' study habits look like. Therefore, in this study, we explored university students' (*N*=29) study habits in six focus group discussions. Preliminary results indicate that students have strong study habits when preparing for exams. During a course, students are more flexible in their study behavior. While students continuously update their existing habits based on whether they serve their short-term goals (passing the exam), they experience breaking habits as difficult and effortful.

What factors influence higher education students' motivation to use cognitive learning strategies
Presenting Author: Marloes Broeren, Avans Hogeschool / Avans University of Applied Sciences, Netherlands; **Co-Author:**Peter Verkoeijen, Erasmus University Rotterdam, Netherlands; **Co-Author:**Guus Smeets, Erasmus University Rotterdam, Netherlands; **Co-Author:**Arends Lidia, Erasmus University Rotterdam, Netherlands

Effective cognitive learning strategies have been proven to be beneficial for learning and long-term retention. Still, students in higher education rely heavily on surface-level strategies like re-reading and underlining, and find it difficult to change their study behavior. Interventions that successfully supported cognitive learning strategy use included strategy instructions, metacognitive knowledge and practice opportunities. However, an important aspect of the potential self-regulated use of learning strategies that has remained underexposed is student motivation. The aim of this study was to gain insight into what factors influence students' motivation to use effective cognitive learning strategies during independent self-study. In our mixed-method approach, we used an online learning strategy questionnaire ($N = 217$) and (online) focus group discussions on motivation and willingness to change ($N = 105$). Participants were first-year students of a Dutch university of applied sciences. Result showed that students used a combination of surface-level and cognitive strategies which they developed themselves during prior education. Perceived value of learning strategies - in particular usefulness of a strategy - was essential for student motivation and was related to the goals students wanted to achieve. Future interventions may need to include this student perspective by building upon students' current (cognitive) strategy use and by emphasizing 'what's in it for them?'.

Session M 8

25 August 2023 12:00 - 13:30
UOM_A03
Symposium

Physical activity and executive functions: from kindergarten to secondary school

Keywords: Cognitive Development, Cognitive Skills and Processes, Developmental Processes, Early Childhood Education, Primary Education, Quantitative Methods, Secondary Education
Interest group:
Chairperson: Kristin Kolloff, University of Bern, Switzerland
Organiser: Christina Heemskerk, University of Bern, Switzerland
Discussant: Ulrich Dettweiler, University of Stavanger, Norway

There is a long-standing interest in whether and what circumstances physical activity during a school day can benefit students' executive functions. This symposium brings together contemporary research on the effects of physical activity (PA) on executive functions (EF). It aims to further the discussion of both the acute and longitudinal benefits of PA for cognition and demonstrate possible practical implementations of increased movement within the school day. The symposium presents studies from a range of school contexts (kindergarten, primary and secondary schools) and includes various forms of PA, such as free-living activities, active breaks, and physical education lessons. A variety of methodologies will target the central research question of the symposium, the nature of the PA – EF link, including a longitudinal study, a microgenetic study and two intervention studies. For one, the results suggest a reciprocal relationship between PA and EF, often overlooked so far, but important to consider for future research. For another, new results will be presented surrounding the nature of the PA, that is its intensity, its quality, and its implementation.
Chair: Michelle Maurer
Discussant: Ulrich Dettweiler

Reciprocal associations between Physical Activity, Motor Skills and Executive Functions
Presenting Author: Anssi Vanhala, University of Helsinki, Finland; **Co-Author:**Anna Widlund, Åbo Akademi University, Finland; **Co-Author:**Johan Korhonen, Åbo Akademi University, Finland; **Co-Author:**Pirjo Aunio, University of Helsinki, Finland

Previous findings have suggested that physical activity (PA) and fundamental motor skills (FMS) are positively associated with executive functions (EF) in preschoolers. However, the longitudinal studies are scarce and the reciprocal associations have not been studied. Therefore, the aim of this study was to examine whether there are reciprocal longitudinal associations of physical activity (PA) and fundamental motor skills (FMS) with executive functions (EF) over two years in preschoolers.
The participants of this study were 286 children aged 3-5 years. Children's PA, FMS, and EF were measured three times with one year between the measurements. PA was measured using waist-mounted accelerometers. Three components of FMS (locomotor, object control and stability skills) were measured with age-appropriate motor skill tasks. Two components of EF (inhibition and switching, and working memory) were measured using computer-based tests. Reciprocal longitudinal associations between PA, FMS and EF were examined using cross-lagged panel modeling.
Only one reciprocal association was found and that was between vigorous PA (VPA) and working memory: VPA had a negative predictive effect on working

memory, while working memory positively predicted VPA. Moderate PA (MPA) and locomotor skills had a positive predictive effect on working memory. In turn, inhibition/switching positively predicted stability skills. Our findings suggest some specific predictive associations both from PA and FMS to EF and from EF to PA and FMS.

Primary school children's physical activity and executive functioning: An intraindividual study
Presenting Author: Lars-Erik Malmberg, University of Oxford, United Kingdom; **Co-Author:**Christina Heemskerk, University of Bern, Switzerland; **Co-Author:**Henry Lo, Oxford University, United Kingdom; **Co-Author:**Patrick Esser, Oxford Brookes University, United Kingdom; **Co-Author:**helen dawes, Oxford Brookes University, United Kingdom; **Co-Author:**Stefan Kodzhabashev, University of Bern, Switzerland; **Co-Author:**Claudia Roebers, University of Bern, Switzerland

We investigated the dynamic relationships between physical activity (PA) and executive functioning (EF, the Hearts and Flowers task) in an intraindividual study. Thirty-nine primary school children (grade 4-6, Mage = 10.0, 21 boys) took part during two weeks at school. They wore an accelerometer wristband throughout and carried out EF tasks (the 'Hears and Flower' task) twice per school day (morning and afternoon). We derived measures to capture acute PA prior to the EF tasks (e.g., walking to school, break time activity): % of time spent in light and moderate to vigorous PA, PA the day before, and total PA during the period. We specified multilevel structural equation models (MSEM, ni = 39, nti = 481). Shifting (ΔRTMixed-RTHearts) and Inhibition (ΔRTFlowers-RTHearts) were equally stable over time. When children exerted more MVPA than usual in the time-window leading up to the EF-task, they performed the inhibition task faster. Relative to girls boys were faster at both inhibition and shifting. The findings provide a

Movement-based learning support in the classroom
Presenting Author: Jennifer Liersch, University of Duisburg-Essen, Germany, Germany; **Co-Author:**Karin Eckenbach, University of Duisburg-Essen, Germany; **Co-Author:**Michael Pfitzner, University of Duisburg-Essen, Germany

The results of several studies show various positive effects of movement on learning: For example, physical activity breaks in the classroom can increase concentration. But exercise also has the potential to promote general cognitive functions. For instance, cognitively demanding movement has a positive effect on the executive functions and school performance of children (Boriss, 2015). Thus, physical activity breaks in the classroom that include a cognitive demand can have a positive impact on executive functions and mathematics achievement (Egger et al., 2019). If the cognitive content of such physical activity breaks is designed mathematically, the effects on mathematics performance can be even higher compared to pure physical activity breaks (Mavilidi & Vazou, 2021). Based on these correlations, an intervention program consisting of cognitively demanding movement games with a subject-didactic orientation was developed. From September 2021 until June 2022, a study was conducted in a controlled pre/post-design in which different types of these cognitively demanding games were implemented in grade 7 (students from 10 to 14 years) at four schools in North Rhine Westphalia (Germany). Subject-oriented content was contrasted with non-subject-oriented content. The concentration and executive-functional performance of the students were assessed. Furthermore, interviews were conducted with the teachers. In addition to general feedback on the implementation of the developed intervention, teachers shared their subjective perceptions of the influences on students and teaching, as well as the opportunities and challenges associated with the content.

Physical activity, behaviour, and executive functions in primary school
Presenting Author: Christina Heemskerk, University of Bern, Switzerland; **Co-Author:**Lars-Erik Malmberg, University of Oxford, United Kingdom; **Co-Author:**Claudia Roebers, University of Bern, Switzerland

Background: Physical activity (PA) can positively affect various aspects of children's cognition. Both executive functions (EF) and task-related behaviour have been used as outcomes in PA research, yet separately. The use of varying methods and outcome measures makes it difficult to compare results and uncover the mechanisms by which PA affects cognition. Method: The same observation instrument was applied in two studies to examine: (1) acute effects of PA on task-related behaviour, (2) the relationship between behaviour and EF. In study one, 76 children (M age = 9.3y) took part in physical education (PE) lessons. During the classroom lesson before and after PE, participants were observed every 30sec ('on-task', 'passive off-task', or 'active off-task'). In study two, 129 children (M age = 7.9y) were observed using the same protocol as in study one, and completed the Hearts and Flowers task. Observation data were analysed in relation to PA (study 1) and in relation to EF (inhibition, study 2). Results: PA of high intensity led to an increase in on-task behaviour after PE (OR = 1.49, d = 0.22). On-task behaviour correlated weakly with measures of inhibition (r = .19, p = .035), as did passive off-task behaviour (r = -.20, p = .026). Conclusion: PA can improve on-task behaviour and reduce off-task behaviour. As on-task behaviour and inhibition correlated, these currently separately regarded effects of PA should be investigated together.

Session M 9

25 August 2023 12:00 - 13:30
AUTH_DC1
Symposium
Cognitive Science

Paying attention to (mathematical) relations: Relational reasoning in mathematical development

Keywords: Cognitive Development, Cognitive Skills and Processes, Mathematics/Numeracy, Primary Education, Quantitative Methods
Interest group:
Chairperson: Patricia Alexander, University of Maryland, United States
Organiser: Jake McMullen, University of Turku, Finland
Discussant: Minna Hannula-Sormunen, University of Turku, Finland

This symposium will examine the role of relational reasoning in the development of mathematical knowledge. Both mathematical relations and general relational reasoning are foundational to understanding many topics in mathematics. In many situations in the mathematics classroom, there are multiple relations that must be attended to in order to solve a problem successfully. Thus, examining individual differences in how students pay attention to different relational aspects of mathematical and non-mathematical situations promises valuable insight into potential causes of individual differences in mathematical development. To this end, this symposium aims to take multiple perspectives on this issue by examining different combinations of (non-)mathematical relations in (non-)mathematical contexts. Overall, these presentations provide a multifaceted lens into the nature of relational reasoning in mathematical development and provide the foundation for future work examining the role of (mathematical) relational attention and preferences in students' development in and out of the mathematics classroom. The first contribution examines relational reasoning in non-mathematical contexts in relation to students' mathematics learning. The second contribution examines how students' attention to mathematical relations in non-explicitly relational contexts predicts their mathematical development. The third contribution examines profiles of students' understanding of additive and multiplicative relations in everyday language, word problems, and texts in relation to their mathematical motivation. The final contribution examines young children's relational preferences for solving additive and multiplicative word problems in relation to their performance on these items.

Exploring the Role of Relational Attention in Math Learning
Presenting Author: Lindsey Richland, University of California, Irvine, United States; **Co-Author:**Hongyang Zhao, University of California Irvine, United States

Children in a mathematics classroom must attend to not only objects visible within the problems or concepts being taught (e.g. objects in word problems, the procedural steps of a problem), but also notice how they relate to each other mathematically, or structurally, in order to reason about them like a mathematician and to transfer and generalize what they learn. Despite this, individual differences in children's spontaneous noticing of structural correspondences have not been the focus of many investigations, though attention to specific mathematical relations (e.g., multiplicative versus additive) has been identified as informative (McMullen et al., 2014). The current study broadens this line of research to children's likelihood of reasoning based on relations more broadly, measuring individual differences in spontaneous relational attention in a sample of 218 fifth- and sixth-grade children. The latent class analysis revealed that children could be systematically grouped into four clusters based on how likely they were to attend to relational correspondences, and importantly, these differences predicted

their learning from the lesson. We found that children who preferentially attended to relations systematically learned more mathematics from the same 20-minute math lesson than those who preferentially attended to objects with the same level of prior math knowledge and Executive Functions (EFs). At the same time, the latter group showed greater learning when the teaching during the lesson explicitly highlighted relational correspondences, suggesting this could be an approach to ensuring equity across all students in learning from high-quality lessons.

Multiplicative and analogical reasoning support the learning of fraction arithmetic
Presenting Author: Hilma Halme, University of Turku, Department of Teacher Education, Finland; **Co-Author:**Minna Hannula-Sormunen, University of Turku, Department of Teacher Education, Finland; **Co-Author:**Jake McMullen, University of Turku, Finland

Fraction understanding is based on grasping the multiplicative relation between the numerator and the denominator. Thus, it is understandable that relational reasoning abilities, including multiplicative reasoning and analogical reasoning, support the learning of fraction knowledge. However, previous research has mainly focused on fraction conceptual knowledge and less is known about the relation between relational reasoning abilities and fraction arithmetic knowledge. Students' struggles with fraction arithmetic are well-documented, and part of their problems arise from a lack of understanding of the relation nature of fractions and the arithmetic with them. Thus, the current study examines how individual differences in relational reasoning predict the development of fraction arithmetic knowledge over three time points within a school year, during and after instructional periods. The 360 fifth and sixth grade students (i.e. 11-12 years old) completed measures of multiplicative and analogical reasoning, and fraction arithmetic and conceptual knowledge. The results show that fraction arithmetic knowledge improves during instruction, from time point 1 to 2, and decreases after instruction, from time point 2 to 3. Relational reasoning predicts both the learning and retention of fraction arithmetic knowledge, even after controlling for fraction conceptual knowledge. Thus, individual differences in relational reasoning abilities appear related to the development of fraction arithmetic knowledge. These results further confirm that relational reasoning may be a crucial support for the development of mathematical skills, including fraction arithmetic.

Profiles of mathematical relational reasoning and students' motivation in fifth grade
Presenting Author: Kaja Mädamürk, Tallinn University, Estonia; **Presenting Author:**Jüri Kurvits, Tallinn University, Estonia; **Co-Author:**Eve Kikas, Tallinn University, Estonia

The current study aimed to investigate what type of mathematical relational reasoning profiles emerge from fifth grade sample including students' whole number calculation skills, comprehension of sentences containing additive and multiplicative relations, complex word-problem solving skills also requiring understanding of additive and multiplicative relations, and comprehension of an expository text regarding relations between different types of numbers (e.g., whole numbers, integers, rational numbers). Furthermore, we examined how these profiles are related to expectancy for success, intrinsic value, and cost, as well as task-persistence and tendency to re-check the expository text while answering the questions about the text. The sample included 345 Estonian students (51% girls). The students filled in an online math test and questionnaires. Based on the latent profile analysis, a four-profile solution was chosen including high and low skill groups but as well two groups having good calculation skills and understanding of the sentences but lower word-problem solving skills and/or low text comprehension. The high skills profile group tended to have better motivational outcomes than all other profiles showing the importance of motivation to reach very good math skill level. The study provides further understanding of how mathematical relational reasoning skills in different contexts are interrelated within different groups of students which in turn can help to develop math education further.

How a relational preference predicts 6-7-year olds' performance on word problems
Presenting Author: Wim Van Dooren, KU Leuven, Belgium; **Co-Author:**Elien Vanluydt, KU Leuven - University of Leuven, Belgium; **Co-Author:**Lieven Verschaffel, KU Leuven, Belgium

The literature on proportional reasoning shows that children often erroneously use additive strategies. However, they also use proportional strategies in additive word problems. Recent studies showed the role of children's "relational preference": in tasks where additive and multiplicative reasoning are equally appropriate, some upper primary school children strongly tend to reason additively on the relations, while others reason as if the relations are multiplicative. This relational preference offers a unique explanation for erroneous word-problem solving in 8- to 12-year-olds, over and above computation and discrimination skills. However, it is still unclear whether relational preference is also associated with word-problem solving at an earlier age, before the start of formal instruction in word-problem solving. In this study, the relational preference of 343 children aged 6-7 was measured, and three additive and three proportional word problems were administered. Results show that already at this young age, relational preference is associated with word-problem-solving behaviour. Having an additive preference is related to better performance on additive word problems but also to additive errors in proportional word problems. Similarly, a multiplicative preference is related with better performance on proportional word problems, but erroneous proportional reasoning in additive word problems remained scarce at this young age. The implications of for research and educational practice are discussed.

Session M 10

25 August 2023 12:00 - 13:30
AUTH_DC3
Symposium

Identifying and assessing Computational Thinking

Keywords: Assessment Methods, Classroom Assessment, Computational Thinking, Early Childhood Education, Instructional Design, Primary Education, Qualitative Methods, Social Aspects of Learning and Teaching, Social Interaction
Interest group: SIG 25 - Educational Theory
Chairperson: Niels Dohn, Aarhus University, Denmark
Organiser: Nina Bonderup Dohn, University of Southern Denmark, Denmark
Discussant: Crina Damsa, University of Oslo, Norway

Computational Thinking (CT) is currently being implemented in most European curricula (Bocconi et al., 2022). There is, however, no single accepted definition of CT and, in consequence, "accurately assessing CT remains a major weakness in this area" (Shute et al., 2017). The present symposium contributes to remedying this major weakness. Drawing on sociocultural understandings of agency, skills, and their use in practice (Säljö, 2000), the four papers discuss how to reconceptualize CT as situated in social practice and corresponding methodological issues of identifying and assessing CT. Three of the papers present empirical examples of situated CT in early childhood education and in compulsory school contexts to discuss different ways CT can be distinguished and assessed. The first discusses the identification of CT as structuring resources in ongoing practice. The second investigates how fiber craft sewing can be conceptualized as algorithmic processes, allowing for novel assessment formats. The third focuses on the complexities of assessing CT skills when CT is integrated in situated teaching of other disciplines, specifically mother tongue language teaching. The last paper presents a theoretical framework, which develops a sociocultural articulation of CT-activities and related assessment criteria. Together, the papers contribute a broadened and differentiated understanding of assessing CT in context.Bocconi, S. et al. 2022. Reviewing Computational Thinking in Compulsory Education. Luxembourg: Publication Office of the European Union.
Shute, V. J., Sun, C. & Asbell-Clarke, J. 2017. Demystifying computational thinking. *Educational Research Review,* 22, 142-158. 10.1016/j.edurev.2017.09.003
Säljö, R. 2000. *Lärande i praktiken: ett sociokulturellt perspektiv,* Stockholm, Prisma.

A holistic approach to identifying computational thinking in preschool settings
Presenting Author: Ane Bjerre Odgaard, University College South Denmark, Denmark

The introduction of computational thinking (CT) in 3-5-year-old children's educational settings informs a growing research field (Bers, Strawhacker, & Sullivan, 2022). Despite explicit valorizations of children's agency and play within this field, activities most often comprise structured CT tasks (McCormick & Hall, 2022), and empirical studies point to tensions between such tasks and children's emergent play practices (Odgaard, 2022). This paper employs a socioculturally informed and design-based approach to examine how CT can be meaningfully implemented in sound alignment with local practices in Danish preschools. This

ambition implies a holistic approach where CT is not assumed *per se* to be central to examined practices, only to the degree that participants make it relevant in mediated action. This approach makes it possible to identify CT across institutionally situated social situations: In child- and educator-initiated play- and learning activities, as well as in institutional routine activities. The paper identifies CT across social situations and points to its relevance and limitations as a structuring resource for children and professionals in preschools. Bers, M. U., Strawhacker, A., & Sullivan, A. (2022). The state of the field of computational thinking in early childhood education. Retrieved from https://www.oecd-ilibrary.org/content/paper/3354387a-enMcCormick, K. I., & Hall, J. A. (2022). Computational thinking learning experiences, outcomes, and research in preschool settings: a scoping review of literature. Education and Information Technologies, 27(3), 3777–3812. doi:10.1007/s10639-021-10765-zOdgaard, A. B. (2022). What is the Problem? A Situated Account of Computational Thinking as Problem-Solving in Two Danish Preschools. KI - Künstliche Intelligenz. doi:10.1007/s13218-021-00752-4

Computational thinking through sewing: Translating across approaches to algorithms
Presenting Author: Anna Keune, Technical University of Munich, Germany

To work toward more inclusive gender representation in computing, researchers and educators are designing instructional materials that are associated with the socio-material practices of those underrepresented in computing. Building on constructionist approaches to learning and research on electronic textiles for broadening computing culture, this research investigated how computational conceptual thinking could be captured in the context of sewing patterns into fabric. The qualitative study analyzed material inquiry sessions with computer science experts who analyzed sewn projects that were made by middle school youth for algorithmic approaches. Iterative and thematic analysis of the material inquiry sessions found that youth have to engage and translate across three approaches to algorithms while creating sewn artifacts. This presents promising inroads for assessing computational thinking in fiber crafts with implications for the utility of the soft context in educational settings.

Identifying and assessing Computational Thinking in three Danish L1 classrooms
Presenting Author: Roland Hachmann, University College South Denmark, Denmark

This paper addresses how to identify and assess computational thinking (Tang et al., 2020; Denning & Tedre, 2019) in primary schools within L1 (mother tongue language) classrooms. Reporting on three conducted Design-Based Research experiments in three different school classes, examples illustrate how a pedagogical design is applied and assessed in a teaching CT skills activity where pupils author interactive stories in the open-source application, Twine. Classroom observations and pupils' Twine stories were analyzed and assessed based on eight criteria, reflecting both the national goals for the subject and CT skills. Although findings suggest that the pupils attained the goals of the design, it is challenging to perform assessments in the cross-section between the L1 subject and CT skills (Weintrop et al., 2021) in the sense that assessing both content knowledge within and outside the subject can blur what is being assessed, and how this can support pupils in their continuous learning process. This challenge needs to be further investigated and discussed. Denning, P. J., & Tedre, M. (2019). *Computational thinking*. The MIT Press. Tang, X., Yin, Y., Lin, Q., Hadad, R., & Zhai, X. (2020). Assessing computational thinking: A systematic review of empirical studies. *Computers & Education*, *148*, 103798. https://doi.org/10.1016/j.compedu.2019.103798 Weintrop, D., Rutstein, D., Bienkowski, M., & McGee, S. (2021). Assessment of Computational Thinking. I A. Yadav & U. D. Berthelsen, Computational Thinking in Education (1. udg., s. 90–111). Routledge. https://doi.org/10.4324/9781003102991-6

Developing a sociocultural framework for identifying and assessing Computational Thinking
Presenting Author: Nina Bonderup Dohn, University of Southern Denmark, Denmark; **Co-Author:**Stig Børsen Hansen, University of Southern Denmark, Denmark

The aim of this conceptual paper is to develop a socioculturally informed theoretical framework for identifying and assessing Computational Thinking (CT); with the purpose of providing guidance for educational practice as regards developing specific assessment tasks. CT has increasingly gained the attention of policy makers, educators, and researchers alike for its prime significance for citizens in the 21st century (Shute et al., 2017). There is, however, as yet no common, accepted definition of CT. Instead, a plethora of understandings of CT prevails, rendering the identification of CT in practice ambiguous and the foci for assessing CT unclear.The framework developed here encompasses activities promoted by the different understandings of CT. We explicate an *engagement condition* for CT-activities: for an activity to be a CT activity, it must require learners to engage with algorithmic processes. This points to two crucial questions. 1) What ontologically is understood to constitute "engagement with algorithms"? 2) What epistemologically counts as "demonstrating engagement"? In answering these questions, we draw on Greeno's (2011) sociocultural reconceptualization of "cognitive phenomena", identified at four different levels. We further provide examples of assessment tasks at each level. Greeno, J. G. 2011. A Situative Perspective on Cognition and Learning in Interaction. *In:* KOSCHMANN, T. (ed.) *Theories of Learning and Studies of Instructional Practice.* New York: Springer. Shute, V. J., Sun, C. & Asbell-Clarke, J. 2017. Demystifying computational thinking. *Educational Research Review,* 22, 142-158. 10.1016/j.edurev.2017.09.003

Session M 11

25 August 2023 12:00 - 13:30
AUTH_T202
Single Paper
Teaching and Teacher Education

Team Teaching

Keywords: Attitudes and Beliefs, Conceptual Change, Educational Policy, Higher Education, In-service Teachers, Pre-service Teachers, Quantitative Methods, Teacher Effectiveness, Teaching/Instructional Strategies
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Penelope Watson, University of Auckland, New Zealand

Empirical Research on the Effectiveness of Team Teaching: Conceptual and Methodological Essentials
Keywords: Conceptual Change, Educational Policy, Teacher Effectiveness, Teaching/Instructional Strategies
Presenting Author: Dries De Weerdt, University of Antwerp, Belgium; **Co-Author:**Mathea Simons, University of Antwerp, Belgium; **Co-Author:**Elke Struyf, University of Antwerp, Belgium; **Co-Author:**Hanne Tack, Ghent University, Belgium

Team teaching is regarded as a promising educational strategy for teachers' professional development and enhancing students' outcomes. Although its promising character, the research field on team teaching remains conceptually scattered and without clear insight into the methodological quality of single studies. Furthermore, researchers and policy makers worldwide are calling for a more transparent overview of the effectiveness of team teaching in current teaching practices in order to provide evidence-informed decision-making. Assuming that experimental research designs are most appropriate for examining the effectiveness of educational interventions, a synthesis of these types of studies may advance current research practices to further demonstrate the impact of team teaching. For this reason, the aim of this paper is to explore how team teaching is conceptualized in experimental studies and to what extent these studies comply with methodological quality requirements. Using a systematic review protocol, an extensive search was conducted of three widely used databases in education research. As a result, 31 experimental studies were included in this review, and examined according to a conceptual framework and critically assessed using a methodological quality appraisal tool. The findings of this review clearly demonstrate the urgent need for more well-defined rigorous experimental research to make convincing claims about the effectiveness of team teaching. Therefore, we conclude with directions for future research on how experimental studies should be conceptually and methodologically implemented in research on the effectiveness of team teaching.

Effective Teaching Behaviour: a Comparison between Individual Teaching and Team Teaching
Keywords: In-service Teachers, Quantitative Methods, Teacher Effectiveness, Teaching/Instructional Strategies
Presenting Author: Aron Decuyper, Ghent University, Belgium; **Co-Author:**Hanne Tack, Ghent University, Belgium; **Co-Author:**Mathea Simons, University of Antwerp, Belgium; **Co-Author:**Ruben Vanderlinde, Ghent University, Belgium

Although effective teaching behaviour is central for student learning outcomes, the extent to which teachers behave effectively in the classroom during team teaching remains unanswered. In the literature there is a general assumption that teachers who team teach manage to teach more effectively than teachers who teach individually. However, there exists no research that empirically proves this to be true. The present paper aims to provide a clear picture of the differences in effective teaching behaviour during individual and team teaching. To achieve this goal, a large-scale cross-sectional survey study (n = 542) was performed among team teachers in compulsory education. The results show that teachers report that they perceive their teaching behaviour to be more effective during team teaching compared to individual teaching. In addition, multilevel analyses were carried out in order to examine whether demographic and team teaching variables have an impact on these perceptions. These analyses show that both education type (i.e., pre-primary, primary and secondary education) and the frequency of team teaching (i.e., percentage of team teaching in the teaching assignment) explain the differences in perceptions of effective teaching behaviour during individual and team teaching.

Collaboration and Shared Responsibility in Team Teaching: Development of an Instrument
Keywords: In-service Teachers, Quantitative Methods, Teacher Effectiveness, Teaching/Instructional Strategies
Presenting Author: Aron Decuyper, Ghent University, Belgium; **Co-Author:**Hanne Tack, Ghent University, Belgium; **Co-Author:**Mathea Simons, University of Antwerp, Belgium; **Co-Author:**Ruben Vanderlinde, Ghent University, Belgium

This paper reports on the development and validation of the Collaboration and Shared Responsibility in Team Teaching (CSTT) scale. This instrument can be used to empirically assess two important dimensions of the practice of team teaching (i.e., collaboration and shared responsibility). The practice of team teaching refers to how team teachers deliver team teaching in the classroom. The purpose of this paper is threefold: (1) development and validation of the instrument, (2) tests of measurement invariance, and (3) descriptive statistics about collaboration and shared responsibility in team teaching. The development and validation of the CSTT proceeded along four different phases. First, items were generated based on the research literature on team teaching. Second, experts were consulted to review the preliminary items. Third, a pilot study (n = 20) was set out and finally, a large-scale validation study with 555 participants was performed using exploratory and confirmatory factor analyses. Results suggest a two-factor structure of key dimensions of the practice of team teaching: collaboration (10 items, $\alpha = 0.949$), and shared responsibility (5 items, $\alpha = 0.879$). Subsequently, differences in teachers' practice of team teaching across several subgroups of team teachers (i.e., teaching experience, education type and frequency of team teaching) were explored using tests of measurement invariance based on multigroup confirmatory factor analyses. Results indicate that teachers across the studied groups interpret the developed measurement instrument in a consistent manner. Lastly, empirical insights are given using descriptive statistics. Results demonstrate that team teachers report high scores on collaboration and shared responsibility.

Student teachers' peer team teaching experiences: perceptions, profiles and transition probabilities
Keywords: Attitudes and Beliefs, Higher Education, Pre-service Teachers, Quantitative Methods
Presenting Author: Loan De Backer, University of Antwerp, Belgium; **Co-Author:**Wouter Schelfhout, University of Antwerp, Belgium; **Co-Author:**Mathea Simons, University of Antwerp, Belgium; **Co-Author:**Ellen Vandervieren, University of Antwerp, Belgium

Collaborative learning within teacher education has gained importance, with student teachers teaming up with each other to support their professional growth. Team teaching implies more than group composition: the challenge is to work collaboratively in the planning, implementation and evaluation of a course. By doing so, student teachers gain a variety of experiences which shape their perceptions of team teaching. Recent qualitative studies have provided promising guidelines and recommendations on this topic for teacher education, but specific information on the dynamics of student teachers' perceptions during workplace learning from a quantitative perspective is lacking. The current study aims to fill this gap by exploring student teachers' perceptions of peer team teaching and the extent to which these perceptions change during collaborative workplace learning. Accordingly, the main objective was to identify profiles of student teachers based on their team teaching perceptions and the transition probabilities – staying in or moving to a certain profile – over time, in an authentic context. To this end, the Student Teachers' Team Teaching Perceptions Questionnaire was administered twice to 181 student teachers who applied team teaching. The overall results reveal that student teachers varied in their perceptions. More specifically, latent profile analysis shows that three distinct team teaching profiles emerged at both time points: (1) *overall negative perceptions*, (2) *positive perceptions mediated by complexity* and (3) *overall positive perceptions*. Moreover, for the vast majority of student teachers in each of these profiles the initial perceptions of team teaching remained the same over time.

Session M 12

25 August 2023 12:00 - 13:30
UOM_R09
Single Paper
Learning and Social Interaction, Motivational, Social and Affective Processes

Motivational and Metacognitive Beliefs in Self-Regulated Learning

Keywords: Attitudes and Beliefs, Cooperative/Collaborative Learning, Feedback, Metacognition, Misconceptions, Mixed-method Research, Parents' Beliefs and Affect, Problem Solving, Problem-based Learning, Secondary Education, Self-efficacy, Self-regulated Learning and Behaviour, Social Interaction
Interest group: SIG 08 - Motivation and Emotion, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Michael Weinstock, Ben-Gurion University of the Negev, Israel

When high confidence in the group and your peers negatively impacts group performance
Keywords: Cooperative/Collaborative Learning, Problem-based Learning, Secondary Education, Self-efficacy
Presenting Author: Jose Hanham, Western Sydney University, Australia; **Co-Author:**Adam Hendry, Parramatta Marist High School, Australia

Background/Aims. In project-based learning groups, students develop shared beliefs about the capabilities of the group (*collective efficacy*), and beliefs about the capabilities of other group members (*proxy efficacy)*. According to Social Cognitive Theory, stronger efficacy beliefs should correlate positively with higher achievement. The aim of this study was to investigate an emerging line of thinking which suggests that in group learning settings, high efficacy beliefs can develop prematurely and negatively impact group performance.Design/Method. A longitudinal design was employed, involving a survey administered at weeks 1, 3 and 5. The sample comprised 168 male students in Grade 8 from a Catholic Boys High School, located in the Sydney, Australia. The participants were randomly assigned to one of 42 groups (4 students per group), who were undertaking a 5-week project in science. Within each group, participants were randomly assigned to one of four roles: coordinator, fixer, checker, communicator. A final group summative task was used as the performance measure. Data were analysed using multilevel modelling.
Results. Collective efficacy for group processing and proxy-efficacy for the coordinator at the mid-point (week 3) of the project were negatively associated with achievement on the summative task. Collective efficacy for group performance at the mid-point of the project was positively associated with achievement on the summative task.
Conclusion. Theoretical perspectives emphasizing the importance of wholesale development of efficacy beliefs in groups should be reconsidered. From a practical perspective, it might be advantageous for teachers to temper the development of some types of efficacy beliefs.

Effects of Feedback Valence and Self-Efficacy on Students' Challenge-Threat Responses
Keywords: Feedback, Problem Solving, Self-efficacy, Self-regulated Learning and Behaviour
Presenting Author: Florence Lucas, Utrecht University, Netherlands; **Co-Author:**Eva Janssen, Utrecht University, Netherlands; **Co-Author:**Maaike Taheij, Utrecht University, Netherlands; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

Feedback effectiveness varies widely across learners. One potential explanation for this could be that the valence of performance feedback affects participants' affective responses differently. According to the biopsychosocial model, whether students experience feedback as challenge or threat might affect their learning from it. However, not much is known about how feedback valence affects learners' challenge-threat responses, and what variables can explain individual differences in these responses to feedback. Therefore, we investigated whether the valence of performance feedback (positive or negative) affected students'

challenge-threat responses towards a problem-solving task, and, additionally, whether this effect was moderated by their self-efficacy. Participants completed a series of problem-solving tasks on which they received manipulated performance feedback, being either predominantly positive (n=74) or negative (n=72). Prior to the tasks, they rated their self-efficacy. Afterwards, they reported their challenge-threat states towards an anticipated second cycle of similar tasks. Regression models showed that negative feedback lowered feelings of challenge and heightened feelings of threat (i.e., fear of not possessing sufficient resources, and intimidation towards the upcoming tasks), compared to positive feedback. Moreover, students with lower levels of self-efficacy reported lowered feelings of challenge and heightened fear of not possessing sufficient resources. In contrast to our expectations, there was no interaction between feedback valence and self-efficacy, suggesting that self-efficacy did not explain individual differences in affective responses to (negative) feedback. Overall, our findings demonstrate that feedback valence affects students' challenge-threat responses. Future research should investigate whether this would indeed affect students' learning from feedback.

Patterns of social interaction and regulation in CL: The role of groups' metacognitive evaluations
Keywords: Cooperative/Collaborative Learning, Mixed-method Research, Self-regulated Learning and Behaviour, Social Interaction
Presenting Author: Eija Vuorenmaa, University of Oulu, Finland, Finland; **Co-Author:**Andy (Khanh Xuan) Nguyen, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland

This study explored the patterns of social interaction and group-level regulation of learning (co- and socially shared regulation) in relation to collaborative learning groups' metacognitive evaluations of collaborative learning tasks and to learning performance. The participants were secondary school students (N=72, 24 groups of three learners) performing collaborative science tasks in physics over four 90-minute sessions. Situated self-reports about learners' perceived task difficulty and task understanding (i.e., metacognitive evaluations) were collected before and after each collaborative session to understand learners' internal conditions that shape how learners approach a task. In addition, after each session learners completed an individual quiz, which provided insight into learning performance. The collaborative sessions were videotaped and analyzed regarding social interaction, group's participation, and group-level regulation. By analyzing groups' metacognitive evaluations of the collaborative task before and after each session, four different types of clusters were distinguished from the collaborative sessions. Descriptive statistics were calculated for each cluster and learning performance was investigated with percentage distribution. In addition, each cluster's collaborative learning process was investigated further with time-related process model analyses to demonstrate patterns of social interaction and regulation in collaborative learning. The results showed that patterns of social interaction and group-level regulation as well as learning performance differ between the identified clusters. The results indicate that metacognitive evaluations shape and are shaped by groups' social interactions that are intertwined with group-level regulation. The results highlight the role of social interaction and regulation in shaping learners' internal conditions for learning and for learning performance.

Educational Findings = Common Sense? The Interplay of Hindsight Bias and Educational Misconceptions
Keywords: Attitudes and Beliefs, Metacognition, Misconceptions, Parents' Beliefs and Affect
Presenting Author: Stephanie Pieschl, Technical University of Darmstadt, Germany; **Co-Author:**Emma L. Goldstein, Technical University of Darmstadt, Germany; **Co-Author:**Leon Scholz, Technical University of Darmstadt, Germany

People often consider findings of educational research "common sense". This is problematic for science communication as well as for studying educational sciences. Many factors contribute to this problem, for example, general cognitive biases such as hindsight and metacognitive overestimation. But content-related misconceptions might exacerbate this issue. To disentangle these effects, we conducted two studies that partially and/or conceptually replicate Langfeldt (1989), a study about hindsight bias in education. In Study 1, n = 150 students of educational sciences judged the predictability of presented research reports that did or did not contain misconceptions in a 2x2 mixed design with the factors *report* (*true vs. falsified*) and *intervention* (*t1* before vs. *t2* after). In Study 2, n = 147 parents judged the predictability of research reports containing misconceptions about raising children in a 2x2 between-subject design with the factors *reports* (*true vs. falsified*) and *prior intervention* (*yes vs. no*). Preliminary results confirm that without prior interventions, participants suffer from the hindsight bias. Interventions seem to make participants more cautious, resulting in lower judged predictability of research reports, but not better at discriminating between true and falsified research reports. Furthermore, participants also seem to suffer from popular psychological misconceptions; these were not systematically affected by the implemented minimal interventions and might need more explicit debunking. We will discuss theoretical and practical implications at the conference.

Session M 13

25 August 2023 12:00 - 13:30
AUTH_TE2
Single Paper
Educational Policy and Systems, Higher Education, Learning and Special Education

Student Engagement, Experiences, Performance and Learning Loss During COVID-19

Keywords: Achievement, Attitudes and Beliefs, Educational Policy, Engagement, Higher Education, Learning Analytics, Mathematics/Numeracy, Pandemic, Primary Education, Qualitative Methods, Social Aspects of Learning and Teaching, Special Education
Interest group: SIG 04 - Higher Education, SIG 15 - Special Educational Needs, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Christian Hartmann, Technical University Munich, Germany

University students' engagement during the pandemic: The role of organization-based self-esteem
Keywords: Engagement, Higher Education, Pandemic, Social Aspects of Learning and Teaching
Presenting Author: Jannika Haase, Leibniz University Hannover, Germany; **Co-Author:**Elisabeth Höhne, Leibniz Universität Hannover, Germany; **Co-Author:**Lysann Zander, Leibniz University Hannover, Germany

During the COVID-19 pandemic semesters, higher education students have experienced drastic academic and social changes. While adapting to remote learning, students reported challenges of maintaining motivation and engagement. Research has shown that students are engaged when they can draw on different individual (e.g., self-efficacy) and social study resources (e.g., social relationships). We investigated the role of students' organization-based self-esteem (OBSE) as a psychological state mediating the relationship between university students' perceived individual as well as social study resources and their engagement at two time points during the pandemic: in summer term 2020 when students found themselves in exclusive remote learning contexts (T1; N_1 = 850) and in winter term 2021/22 (T2; N_2 = 384) after universities had returned to face-to-face teaching. OBSE significantly mediated the relationship between students' individual (academic self-efficacy) as well as social study resources (instructors' support, low peer exclusion) and students' engagement at both time points. Our findings show that feeling valued and important is a crucial determinant for university students' sustained engagement in challenging remote and face-to-face learning environments.

COVID-19-related school closures and mathematical performance of grade 3 students in Germany
Keywords: Achievement, Mathematics/Numeracy, Pandemic, Primary Education
Presenting Author: Hedwig Gasteiger, Osnabrück University, Germany; **Co-Author:**Karoline M. Sachse, Institut für Qualitätsentwicklung im Bildungswesen, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Kristoph Schumann, Institut für Qualitätsentwicklung im Bildungswesen, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Mona Gerve, Osnabrück University, Germany; **Co-Author:**Axel Schulz, University of Bielefeld, Germany; **Co-Author:**Maria Engelbert-Kocher, Institut für Qualitätsentwicklung im Bildungswesen, Humboldt-Universität zu Berlin, Germany

Due to the COVID-19 pandemic, measures were taken, which had a considerable impact on the school situation. In Germany, these measures lasted more than a year and ranged from school closures and distance learning to alternating teaching phases with small groups. To date, numerous surveys were carried out

with students, teachers, and parents that reveal the stresses of teaching and learning during this time. However, there are few comparative studies on mathematical performance before and after the period of school closures. In the present study, we examined whether third-grade students' mathematics performance changed in different content domains before and after the COVID-19-related changes in school. In a repeated cross-sectional design, we compared two cohorts of third graders (2019: *N*=1,905; 2021: *N*=3,203) on standardized mathematics tests, constructed according to the German National Educational Standards, which allow a differential competence diagnostic for five content domains. There was a significant drop in performance overall. While the drop in the content domain Numbers and Operations was comparable to the overall drop in performance, the content domains Space and Form and Data and Probability were more affected. Also, tasks with a higher requirement level appeared to be more difficult in 2021 than in 2019. Results of the numerous surveys revealed that much time during distance learning was spent on exercises and reproductive tasks, which could explain the results.

Disabled students' educational and psycho-social experiences during the COVID-19 pandemic crisis
Keywords: Attitudes and Beliefs, Pandemic, Qualitative Methods, Special Education
Presenting Author: Filippos Papazis, National and Kapodistrian University of Athens, Greece; **Co-Author:**Anastasia Toulia, Department of Special Education, University of Thessaly, Greece; **Co-Author:**Anastasia Vlachou, Department of Educational Studies, National and Kapodistrian University of Athens, Greece; **Co-Author:**Theodora Papazoglou, Department of Educational Studies, National and Kapodistrian University of Athens, Greece; **Co-Author:**Aristea Fyssa, Department of Educational Sciences and Early Childhood Education, University of Patras, Greece; **Co-Author:**Lia Tsermidou, Department of Educational Studies, National and Kapodistrian University of Athens, Greece; **Co-Author:**Stavroula Kalaitzi, Department of Educational Studies, National and Kapodistrian University of Athens, Greece

The COVID-19 outbreak has high and virtually deleterious effects on all aspects of disabled pupils' lives, affecting also their developmental progress, school learning and wellbeing. Due to the pandemic sealing off, and other social distancing measures, disabled learners faced significant challenges amplifying their ongoing segregation and discrimination from educational structures and services. In the light of the above, this study aims to explore the lived experiences of primary and secondary school-aged disabled students as they are transitioning from quarantine and distance education back to their schools during the pandemic crisis. In particular, this qualitative study aims at addressing disabled students' voices through the use of semi-structured interviews about the impact of COVID-19 policy decisions in Greece on their educational life, psychology, and social relationships with others. The analysis unfolds around five main thematic axes: 1) educational experience(s) during the implementation of remote learning (accessibility, structure and organization of learning), 2) challenges (educational domain, social domain, lack of services and accommodations, specific needs related to remote learning, changes in everyday life), 3) positive experiences during the implementation of remote learning, 4) support (educational, psycho-social), and 5)returning to school-emerging from lockdown (educational support, psycho-social support). In most cases of students there was an evident absence of psychological support offered to them while those who attended general schools highlighted, the inability of their special education teachers to adopt their role and offer support to the remote learning.

Catching up after Covid-19: Do school programs for remediating pandemic-related learning loss work?
Keywords: Achievement, Educational Policy, Learning Analytics, Pandemic
Presenting Author: Martijn Meeter, Vrije Universiteit Amsterdam, Netherlands

Worldwide, COVID-19 has had a major impact on education, with school closures leading to steep learning losses. In the Netherlands, learning gains were found to be lower across the board after an eight-week school closure period in the spring of 2020 than they would otherwise have been. This was true for both primary and secondary education, and learning losses were particularly pronounced for students whose parents had enjoyed less education.
A government subsidy was set up that allowed schools to create a catch-up program for their most vulnerable students. Schools could set up these programs early in the pandemic (from September 2020 on) and had near total freedom in their design: They chose the target domain, the methods, the staff, and the criteria on which they selected participants. This raises the question of whether such programs achieved their goals, and whether lessons can be drawn on what types of programs, or what characteristics of programs, are associated with better remediation.
Here, sixteen programs from eight secondary schools were analyzed. Results were aggregated using meta-regression. No effects were found for general skills programs or homework guidance, but positive effects of small-to-medium size were found for subject-specific tutoring programs. There was large heterogeneity between schools, which can be interpreted using qualitative data gathered from the same schools.

Session M 14

25 August 2023 12:00 - 13:30
UOM_A04
Single Paper
Cognitive Science, Learning and Special Education

Programs and Tools Supporting Students with Special Educational Needs

Keywords: Achievement, At-risk Students, Classroom Management, Cognitive Skills and Processes, Digital Literacy and Learning, Inclusive Education, Learning and Developmental Disabilities, Meta-analysis, Motivation, Self-regulated Learning and Behaviour, Special Education
Interest group: SIG 15 - Special Educational Needs
Chairperson: Jo Van Herwegen, United Kingdom

The Effectiveness of Feuerstein's Instrumental Enrichment Programme: A Systematic Review
Keywords: Achievement, At-risk Students, Cognitive Skills and Processes, Meta-analysis
Presenting Author: Jo Van Herwegen, UCL Institute of Education, United Kingdom; **Presenting Author:**Petri Partanen, Mid Sweden University, France

Background: Feuerstein's Instrumental Enrichment (FIE) programme is designed to improve cognitive functions thus raising academic achievement and improving related behaviours, especially for those with special educational needs. The evidence as to the effectiveness of FIE is mixed and therefore a systematic review was undertaken to present an updated evaluation of the existing research and the efficacy of FIE, with regards to three domains: cognitive, affective and academic achievement.Methods and Procedures: In total 57 studies from 55 papers were identified via the search process of a systematic review following PRISMA guidance. The protocol of which was preregistered: https://osf.io/g9x5b.Results: Overall, the most beneficial effect was found in the cognitive domain, both on general cognitive ability and cognitive specific measures such as reasoning and spatial abilities with effects ranging from small to substantial. The effects of FIE on academic achievement and affective measures was less pronounced and more inconsistent. Mathematical ability proved more susceptible to improvement than other academic areas, whilst impulsivity was substantially reduced in a number of studies. However, several methodological issues were identified in the body of research that made it difficult to fully evaluate both the effectiveness of FIE and the determination of moderator variables, particularly in the affective and achievement domains.Conclusion: FIE appears to be effective to raise cognitive abilities. However, there is a need for more robust research to fully determine its effect on academic achievement and affective domains. We will discuss improvements for intervention research for pupils with special educational needs.

The use of ICT in Special Needs Education – a systematic review
Keywords: Digital Literacy and Learning, Inclusive Education, Motivation, Special Education
Presenting Author: Daniela Nussbaumer, University of Applied Sciences of Special Needs Education, Switzerland

The use of Information and Communication Technologies (ICT) is an important topic for school education worldwide, not least because of Covid-19. In the field of special education, ICT is also of central importance for the participation and academic achievement of the students as well as the multi-professional cooperation of the teachers. However, there are currently only a few studies on the use of ICT in special education. The aim of the present work was therefore to identify and summarize studies on the use of ICT in special education from the past 10 years. A systematic database search identified 18 articles, which could be categorized into 4 groups: "ICT usage, attitude, and knowledge" (8), "ICT interventions" (4), "reviews" (3), and "satisfaction with ICT-supported learning" (2). Support for reading and writing is identified as the most common type of use. The knowledge of special education teachers is named as the central challenge. At

the same time, the few intervention studies indicate evidence-based of approach. A major challenge for research is the use of terminology and thus findability in the context of ICT.

The Good Behavior Game for children with Special Educational Needs: A scoping review
Keywords: At-risk Students, Classroom Management, Inclusive Education, Self-regulated Learning and Behaviour
Presenting Author: Maria Jornevald, Stockholm University, Department of Special Education, Sweden; **Co-Author:**Hanna Ginner Hau, Stockholm University, Sweden; **Co-Author:**Lise Roll-Pettersson, Stockholm University, Department of Special Education, Sweden

The aim of this scoping review was to map peer reviewed research on the classroom management strategy the Good Behavior Game (GBG) for children with Special Educational Needs (SEN) in mainstream education settings, and to identify any evidence gaps that need to be addressed by future research. Following a systematic search-and selection procedure 30 studies were included, of which 26 were effect-studies and four used a qualitative/mixed-methods design. SEN participants in the studies were mainly subgroups of children identified through baseline assessments of emotional-behavioral or academic difficulties. Overall, there was substantial clinical and methodological heterogeneity across studies, which precludes cross-comparisons and generalization to larger populations of children with SEN.
Integrative findings from quantitative and qualitative studies indicate that the GBG can support the behavior, peer relations and academic performance for children with SEN in mainstream settings. This is important given the long-term educational, social and health benefits previously associated with the model. However, small- groups or individual children with more severe difficulties may struggle to benefit from the intervention, and this appears to pose a challenge for teachers. Schools implementing the GBG should be aware that some children may need individual adaptations to participate in the GBG, and that teacher may need additional support to implement these adaptations. This Scoping review identified a paucity of research on children with pre-existing conditions such as ADHD or ASD, on challenges associated with the GBG for children with severe risk and on the perspectives of SEN participants and their teachers in mainstream education

A large-scale Check in Check out study in Finnish PBS schools: Intervention response and moderators
Keywords: At-risk Students, Learning and Developmental Disabilities, Self-regulated Learning and Behaviour, Special Education
Presenting Author: Mika Paananen, University of Jyväskylä, Finland; **Co-Author:**Anne Karhu, University of Eastern Finland, Finland; **Co-Author:**Asko Tolvanen, University of Jyväskylä, Finland

Check in Check out (CICO) is widely used intervention in Positive Behaviour Support (PBS) schools for pupils who do not benefit enough from universal level support and need individualised behaviour support. Evidence from previous research suggest that CICO is effective for pupils demonstrating problem behaviour, however, a large-scale study of effectiveness of the CICO intervention is lacking. In this presentation we describe outcomes of the CICO intervention in Finnish PBS schools. We also scrutinize the possible effects of different moderators on behaviour change. Fifty-one pupils participated the study. Behaviour of the participating pupils were followed before, during and after the CICO support using two data collection methods, School Situation Questionnaire and Daily Report Card. Moderating variables were individual level factors. The results revealed that CICO was delivered mostly for boys and large number of pupils (56%) were identified with special education needs (tiers 2 or 3 support) and thirty-four percent of pupils had neuropsychiatric diagnosis (ADHD or ASD). At the group level, during the CICO intervention a large change in pupils' behaviours was detected. Individual level factors were not connected to the change in behaviours. In sum, the results of this study support the effectiveness of CICO, and it seems to be effective in all grade levels and regardless of if pupil has specific need for pedagogical support or behaviour related diagnose.

Session M 15

25 August 2023 12:00 - 13:30
UOM_A10
Single Paper
Higher Education, Lifelong Learning

Lifelong Learning in the Workplace: Motivational and Behavioural Factors

Keywords: Communities of Learners and/or Practice, Cooperative/Collaborative Learning, Goal Orientations, Higher Education, Informal Learning, Learning Strategies, Lifelong Learning, Metacognition, Motivation, Self-determination, Self-efficacy, Self-regulated Learning and Behaviour
Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion, SIG 14 - Learning and Professional Development, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Jean-Francois Rouet, University of Poitiers, France

The Effect of Goal-Setting on Work Environment, Transfer Motivation and Transfer of Training
Keywords: Goal Orientations, Lifelong Learning, Motivation, Self-efficacy
Presenting Author: Bastian de Jong, University of Amsterdam, Netherlands; **Co-Author:**Frank Cornelissen, University of Amsterdam, Netherlands; **Co-Author:**Joost Jansen in de Wal, University of Amsterdam, Netherlands; **Co-Author:**Thea Peetsma, University of Amsterdam, Netherlands

Abstract Despite large investments of companies in employee training, transfer of training content to the work practice remains low. One important component influencing transfer of training is transfer motivation, which in turn can be influenced via personal and contextual motivational antecedents of transfer motivation. Previous research has shown the potential to raise transfer of training with a goal-setting intervention. However, it is unknown via which mechanisms goal-setting influences personal and contextual antecedents and transfer motivation. This study investigated these mechanisms through the lens of the Unified Model of Task-Specific Motivation. Data were collected among 359 participants (38 trainings). Participants were randomly assigned to either the goal-setting intervention group or the control group. Both groups were asked to fill in a questionnaire directly after the training and after six weeks. Preliminary analyses were conducted using independent sample t-tests and regression analyses. Results indicated that the intervention group scored more positive on contextual antecedents and transfer motivation than the control group. Moreover, the influence of the contextual antecedents on transfer motivation was lower for the intervention group than the control group. On the other hand, we found no differences for the personal antecedents, nor for transfer of training between both groups. These outcomes provide more insight in the mechanisms as to how goal-setting can influence transfer of training. Moreover, it underlines the utility for trainers and policy makers to integrate a goal-setting element in trainings.

Socially shared regulation of learning in workplace teams – When and how does it appear?
Keywords: Cooperative/Collaborative Learning, Lifelong Learning, Metacognition, Self-regulated Learning and Behaviour
Presenting Author: Niina Palmu, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland; **Co-Author:**Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:**Piet Van den Bossche, University of Antwerp, Belgium

The aim of this study is to understand how socially shared regulation of learning (SSRL) appear during authentic team meetings of professionals. SSRL refers to a team's joint attempt to manage the changes and adapt to challenges through negotiated, iterative fine-tuning of cognitive, behavioral, motivational, and emotional conditions. While SSRL have been found to contribute to collaborative learning, it has not been studied in the context of professional collaboration. The research data was collected from 10 workplace teams (4-15 team members). A total of 30 one-hour team meetings were video recorded. The participants were from small to medium-sized companies in creative and ICT-industry. The data was analyzed in two stages: First locating episodes of SSRL from the interaction taking place in the team meetings and then identifying the phases (reflection, task definition, goal setting and planning, task enactment and adaptation) in each SSRL episode. The preliminary analysis shows that the frequency of SSRL episodes was 0-4 per team meeting and the duration varied between 5min30s and 26min30s. While SSRL was found to occur in most of the team meetings, the preliminary findings indicate that professional teams rarely attain the adaptation phase, although other phases of SSRL are recognized in the team meetings. The significance of this study is connected to the lack of research on SSRL in the workplace context and unpacking the learning and collaboration skills needed as rapid transformations take place in the labor market.

Academic teams – a space for individual and cooperative competence development
Keywords: Communities of Learners and/or Practice, Cooperative/Collaborative Learning, Higher Education, Informal Learning
Presenting Author: Franziska Zellweger, Zurich University of Teacher Education, Switzerland; **Presenting Author:**Mirjam Kocher, University of Education Zurich, Switzerland

This contribution focuses on the competence development of scientific staff in the context of teamwork "on the job" at Swiss universities of teacher education and universities of applied sciences. So far, competence development has been considered from an individual perspective. In recent literature, a dual competence profile of the scientific staff is assumed, which recognise the scientific and practical professional competencies as equally important (Biedermann et al., 2020). The development of a such a comprehensive competence profile of all faculty poses high expectations on individuals. In addition, this claim cannot be limited to the beginning of a professional career. Rather, competence development is a permanent task and thus a central topic of team development, team collaboration and team learning (Edmondson & Harvey, 2018; Robbins, 2021). The following question is in focus: How does scientific staff perceive the collaboration in teams as a space for competence development in the dual orientation toward research and practice? By the time of the presentation, results of a questionnaire survey and qualitative content analysis of 30 interviews are available. First findings indicate that the scientific staff perceives the development of competencies more as an individual than a team process. Although highly engaged routines of team learning can be observed, some visible tensions are rooted in the academic context. Detailed results will also be put up for discussion regarding team interventions.

Exploring qualitative differences in motivation and learning among low-educated adults
Keywords: Learning Strategies, Lifelong Learning, Self-determination, Self-regulated Learning and Behaviour
Presenting Author: Bea Mertens, University of Antwerp, Belgium; **Co-Author:**Sven De Maeyer, Antwerp University, Belgium; **Co-Author:**Vincent Donche, University of Antwerp, Belgium

Adult secondary education (ASE) provides a second chance for adults who did not finalize secondary education, in order to prepare them for lifelong learning (LLL). Although good-quality motivation and good-quality learning strategies are crucial components herein, the quality of learning processes in adult education in general are an understudied terrain. This study examined the extent to which these key components are developed in low-educated adults and whether qualitatively different learning profiles can be distinguished by relating three crucial learning components: motivation, regulation and processing strategies. In this study participated 304 adult learners from five ASE-institutions. Learning profiles were mapped using latent profile analysis, a number of variance analyses and crosstabs. We found qualitatively different profiles within the three separate learning components, as well as relationships between the good-quality profiles on the one hand and the poor-quality profiles on the other. When integrating the three components into motivational-learning profiles, we found a good- versus a poor-quality motivational-learning profile, but also an ‘amotivation’ profile, in which poor-quality motivation is related to a moderate quality of regulation and processing strategies used. This study adds to existing theorization of adult learning and provides a pivotal knowledge base for educational practice, as the distinction between good- and poor-quality learners enables instruction to better support and stimulate learning processes, to also prepare low-educated adult learners for a qualitative LLL-trajectory.

Session M 16

25 August 2023 12:00 - 13:30
UOM_A11
Single Paper
Developmental Aspects of Instruction, Learning and Instructional Technology, Learning and Social Interaction

Argumentation and Reasoning: Educational Aspects

Keywords: Argumentation, Attitudes and Beliefs, Citizenship Education, Cognitive Development, Computer-supported Collaborative Learning, Developmental Processes, Dialogic Pedagogy, Educational Technologies, Informal Learning, Large-scale Assessment, Learning Approaches, Peer Interaction, Reading, Reasoning, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 01 - Assessment and Evaluation, SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Jeff Vomund, George Mason University, United States

Perspective-taking and -getting’s impact on learning and attitudes in a text-based context
Keywords: Argumentation, Attitudes and Beliefs, Citizenship Education, Informal Learning
Presenting Author: Paulo Jose Medeiros dos Santos, Saarland University, Germany; **Co-Author:**Armin Weinberger, Saarland University, Germany

Scenarios of argumentative knowledge construction often challenge learners to argue for perspectives dissonant to their own and are geared to prepare learners for debating divisive topics on text-based social media. Perspective-related approaches that aim to evoke empathy for the other side of the debate have a potential impact on learning and on attitudes in such scenarios. With this 2×2-study (n = 431), we investigate the impact and interaction of perspective-getting (with vs. without) and perspective-taking (consonant vs. dissonant) on knowledge acquisition, subjective learning gains, attitude change, and behaviour change intention in a text-based medium. Results show significant main effects of perspective-taking on learning and attitudes.

Promoting Knowledge Acquisition through Argumentation
Keywords: Argumentation, Learning Approaches, Reading, Reasoning
Presenting Author: Kalypso Iordanou, University of Central Lancashire, Cyprus

In the present work we examined whether engagement in argumentation practice can promote knowledge acquisition while simultaneously supporting argument skill development. We examine the effectiveness of a dialog-based argument curriculum in fostering 112 middle-school students' knowledge acquisition as well as written argument skill with respect to the topic of tackling climate change. Results showed a single intervention could meet both objectives. The method of providing evidence in the form of question-and-answer was found superior to a traditional one in promoting acquisition of knowledge on the topic. The Q&A condition was similarly superior in gains in argument skills, in using evidence to support their own position and weakening others position. In a second study, we extend the findings to a humanistic topic, the topic of immigration.

The impact of inductive reasoning on school achievements
Keywords: Cognitive Development, Developmental Processes, Large-scale Assessment, Reasoning
Presenting Author: Benö Csapó, University of Szeged, Hungary; **Co-Author:**Edit Tóth, SZTE Institute of Education, Hungary

Inductive reasoning (IR) is one of the most intensively researched cognitive abilities. It is related to intelligence and problem solving, and it is essential in the learning processes, thus, its developmental level determines academic achievements. Former research exploring the role of IR in school learning mostly used data collected in one measurement point and correlational analyses which do not allow establishing causal relationships. The present study utilizes data from the Hungarian Educational Longitudinal Program (HELP) and examines how the performances in inductive reasoning predict academic achievements in the following years. Participants of the study were representatively selected form the Hungarian primary schools; the sample sizes vary between ca. 4000 and 7000. Data of three cohorts are used in the present analyses. Beyond IR, reading, mathematics, science, foreign languages and problem solving were assessed at several points of students’ school career. The explored relationships span from the first to the eight grade of schooling. The results indicate the strong predictive power of IR on each school subjects included in the study; even IR measured at Grade 1 correlates well with the achievements at the end of the primary school. By the upper primary years, the development of IR consolidates and its correlations are getting stronger. Furthermore, IR plays a more important role in learning English than in German, and at the upper grades, its impact is more visible in the mathematics than in the reading achievements.

Microblogging and classroom talk
Keywords: Computer-supported Collaborative Learning, Dialogic Pedagogy, Teacher Professional Development, Teaching/Instructional Strategies
Presenting Author: Anja Amundrud, University of Oslo, Norway; **Presenting Author:**Maren Omland, Oslo Metropolitan University, Norway; **Co-Author:**Ingvill

Rasmussen, University of Oslo, Norway

Digital technologies, such as iPads, mobile phones, laptops, and interactive whiteboards, are now used in most Norwegian classrooms and have, in various ways, changed how teachers and students work and interact. However, despite technology-induced change, language remains our most important tool for learning. Research shows that teaching students in primary and secondary education how they can use their language productively in educational dialogue to learn through interactions is beneficial. Today, explicit teaching of the dialogue skills needed for learning is sparse, and the increased use of digital technology shows a tendency to more individualised activities, leaving less time for interacting in educational dialogue. In this paper, we focus on these challenges and report the findings from a project with teachers from four different schools in Norway. The project aimed to incorporate dialogic pedagogy while using a digital microblogging technology, Talkwall, which is designed to help teachers engage their students in educational dialogue. In Talkwall, students talk together in small groups and write short messages that can be displayed, arranged and distributed across students' devices and digital whiteboards for discussion in the whole class. The study explored the use of Talkwall in the classroom, specifically the teachers' practices when combining an explicit focus on educational dialogue and microblogging, and the ways in which microblogging can enhance students' participation in educational dialogue.

Deepening and Broadening the Dialogue of Collaborative Learners with Conversational Agents
Keywords: Argumentation, Computer-supported Collaborative Learning, Educational Technologies, Peer Interaction
Presenting Author: Armin Weinberger, Saarland University, Germany; **Co-Author:**Birk Thierfelder, Universität des Saarlandes, Germany

Abstract. Conversational Agents (CAs) can adaptively scaffold online discourse of learners. CAs can either monitor and react to the concepts that learners bring up, aiming to deepen the conversation, or activate when a pertinent concept is not used for a prolonged time span and suggest broadening the conversation towards the concepts that have not been talked about. Respectively in this 1×3 study on CAs (without, deepening, and broadening), learners were prompted to further develop an idea they are already familiar with or to pay attention to a subject they have not yet studied. We look at how these CAs help online learners cover conceptual ground during a problem-solving activity. In terms of supporting how students cover the domain collectively, the Broadening CA performed better than the Deepening CA. The discussants rated their learning gains similarly between conditions, while the acceptance of the agents' performance was somewhat negative. Keywords: Argumentation, CSCL, Peer Interaction, Technology-enhanced Learning

Session M 17

25 August 2023 12:00 - 13:30
UOM_A08
Single Paper
Assessment and Evaluation, Lifelong Learning, Motivational, Social and Affective Processes

Schools as Supportive Contexts for Students At-Risk

Keywords: Assessment Methods, At-risk Students, Attitudes and Beliefs, Competencies, Cultural Diversity in School, Inclusive Education, Learning Approaches, Migrant / Refugee and Minority students, Qualitative Methods, Social Sciences and Humanities, Teacher Professional Development, Teaching/Instructional Strategies, Well-being
Interest group: SIG 15 - Special Educational Needs, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Bob Kapteijns, Behavioural Science Institute, Radboud University Nijmegen, Netherlands

Support for Children from Low-Income Families by Promoting Effective Learning Strategy Use
Keywords: Inclusive Education, Learning Approaches, Teacher Professional Development, Teaching/Instructional Strategies
Presenting Author: Yuri Uesaka, The University of Tokyo, Japan

Children from low-income families tend to have low academic achievement and low motivation to learn. Support for economic and social independence is necessary to break the negative cycle that is passed down from generation to generation, but conventional support tends to focus on providing a place to stay and teaching individuals what they do not know; in many cases, this is not the support necessary for independence. To address this problem, using research into learning strategies to provide students with opportunities to promote learning skills may be important. However, a prior study has shown that supporters in low-income areas do not always welcome support from this perspective. Therefore, it is necessary not only to elucidate appropriate methods for cultivating effective learning strategy use in children from low-income families, but also how best to convey the importance of such cultivation to staff who are supporting them. This presentation will introduce a practice at a facility that helps children from welfare-receiving families; the practice was developed to include training sessions for staff and a course with six programs to promote students' learning strategies. Through interviews with facility staff, we will demonstrate how the supporting staff for children from low-income families gradually started to share the concept of facilitating learning strategies. We also used questionnaires and interviews to examine the impact of a learning strategies promotion program on students from low-income families.

How can schools protect immigrant students from depressive symptoms?
Keywords: At-risk Students, Cultural Diversity in School, Migrant / Refugee and Minority students, Well-being
Presenting Author: Rekar Abdulhamed, University of Helsinki, Finland; **Co-Author:**Kirsti Lonka, University of Helsinki, Finland; **Co-Author:**Lauri Hietajärvi, University of Helsinki, Finland; **Co-Author:**Reija Klemetti, Finnish Institute for Health and Welfare, Finland

Children and youth from immigrant families may face several obstacles in their developmental paths compared to their native counterparts. For example, the demands of acculturation and identity development in intercultural contexts (home vs. host nation), discrimination and lack of sense of belonging, and learning via second language may pose challenges (Suárez-Orozco et al., 2018). There is a growing literature demonstrating that immigrant origin children and youth demonstrate a higher prevalence in mental health i.e., depressive, and generalized anxiety symptoms (Abdulhamed et al., 2022). This may risk their academic achievement (Owend et al., 2012), as there is evidence that depression reduces cognitive functions among children and youth (Wagner et al., 2015). However, less is known about school related factors, which protect immigrant children and youth from mental health symptoms, and what kind of a role could the school environment and school related factors play in diminishing the risk of depressive symptoms. This question is in the focus of the present study. We assessed whole population samples of children attending 4th and 5th grades of lower-level comprehensive school from three time points (2017, 2019 and 2021) in Finland. Children from immigrant families in (N = 14 930) were grouped to first- and second-generation migrant groups, and to forced (i.e., refugee background) and voluntary (i.e., migration due to employment) migrant groups. We also assessed estimate differences of immigrant origin youth to host national youth by means of moderation analyses (N = 259 382).

A New Instrument to Assess Trauma-related Components of Teachers' Competencies
Keywords: Assessment Methods, Attitudes and Beliefs, Competencies, Teacher Professional Development
Presenting Author: Friedrich Linderkamp, University of Wuppertal, School of Education, Germany; **Co-Author:**Bodo Przibilla, University of Wuppertal, School of Education, Germany; **Co-Author:**Gino Casale, University of Wuppertal, Germany

Trauma-informed work in schools is increasingly important due to global migration dynamics of children with high risk for traumatization. Dealing with trauma-related behavior is challenging for teachers because (subclinical) symptoms are extremely heterogeneous. Teachers are likely to misinterpret problem behaviors promoting unfavorable support decisions. Additionally, trauma-related work requires high emotional resilience, e.g., to process information about threatening incidents students experienced or to self-regulate after relapses. Beyond professional knowledge (e. g. pedagogical content knowledge), teachers competencies comprise cognitive and affective-motivational dimensions (e. g. motivational orientations, the ability to self-regulate, teachers' beliefs, and attitudes). Although attitudes, knowledge, and self-efficacy beliefs of teachers are highlighted in research on trauma-informed schools, there is a lack of internationally comparable instruments to assess these dimensions, particularly regarding trauma-related challenges. This study presents the intercultural adaption and validation of the Attitudes Related to Trauma Informed Care scale (ARTIC) for German teachers. 725 teachers completed a survey including a pretested German ARTIC version and several validity measures (attitudes, knowledge, job-related stress, self-efficacy). After missing data, outlier, and item analyses, 29 items and 505 cases

were used for EFA and CFA with two randomly drawn subsets of the data. We found a 4-dimensional bifactor model fitting the data best, expected correlations with the validity measures as well acceptable to high reliabilities. Although we could not reproduce the original ARTIC structure, the scale appears to be interpretable, reliable, and valid for German contexts. Implications for further studies on measurement invariance and teachers' competencies are discussed.

Pedagogy of hope in prison? The case of emotional education in a prison – a therapeutic community
Keywords: Inclusive Education, Migrant / Refugee and Minority students, Qualitative Methods, Social Sciences and Humanities
Presenting Author: Sergio Grossi, Researcher (Marie Curie Fellow) - Complutense University of Madrid, Spain

Prison in Europe is increasingly becoming a multicultural environment due to the high presence of migrants. Education aimed at the reintegration of convicted persons – one of the objectives of the sentence according to international law – is described as bureaucratic marketing in sociological and criminological studies. Pedagogy has developed several theoretical proposals to rethink education for convicts and several studies have analysed concrete model proposals that have been implemented in projects for the social reintegration of convicts. In particular, different model experiences in England, USA, Italy, and Norway will be analysed and compared with the experiences already analysed in Spain, Brazil, Uruguay, and Argentina. Discourses describing these experiences will be analysed through their self-presentation. In order to analyse the practices in the model units, a three-month short ethnography will then be conducted which will include the writing of a field diary and 40 open-ended and semi-structured interviews with staff and convicts. Data obtained in these analyses will be used to compare different experiences, allowing an assessment of the current situation in terms of best practice in education and reintegration for the social inclusion of convicted people. In this presentation, the proposal of Grendon Prison, one of the best practices in England, will be analysed. This prison is run as a therapeutic community and, according to the interviews conducted there, it is an educational opportunity for various subjects to recognise and discuss their emotions. Thus, this study fills a gap in education and prison sociology by interconnecting these disciplines.

Session M 18

25 August 2023 12:00 - 13:30
UOM_R05
Single Paper
Assessment and Evaluation, Instructional Design, Teaching and Teacher Education

Learning and Assessment in Science Education

Keywords: Assessment Methods, Classroom Management, Comprehension of Text and Graphics, Feedback, Inquiry Learning, Instructional Design, Interest, Peer Interaction, Primary Education, Quantitative Methods, Reading, Science and STEM, Science Education, Secondary Education, Teacher Effectiveness, Teacher Professional Development
Interest group: SIG 01 - Assessment and Evaluation, SIG 02 - Comprehension of Text and Graphics, SIG 11 - Teaching and Teacher Education
Chairperson: Jennifer Meyer, Leibniz Institute for Science and Mathematics Education (IPN), Germany

Teacher professionalization in integrating literacy and science education: A design-based research
Keywords: Primary Education, Reading, Science and STEM, Teacher Professional Development
Presenting Author: Hilde Kooiker, Utrecht University/HZ University of Applied Sciences, Netherlands; **Co-Author:**Ted Sanders, Utrecht University, Netherlands; **Co-Author:**Jacqueline Evers-Vermeul, Utrecht University, Netherlands

Abstract (244 words)Despite promising results in research on effective reading instruction, many countries still face a lack of improvement in literacy outcomes, partly due to a research-practice gap. The collaboration between researchers and practitioners in design-based research (DBR) seems a promising approach to close this gap; it can offer solutions to educational practice and serve as a vehicle for teacher professionalization. In our study we took two evidence-based recommendations for reading education that are often neglected in Dutch primary education 1) embed reading instruction in content-area subjects and 2) teach children about text structures, and applicated them in science education. Four design principles were formulated. Two research questions guided our research: 1) How viable are the design principles in educational practice? 2) What level and type of support do teachers need to successfully apply the design principles in the design of their lessons and in educational practice? Two researchers and nine teachers developed four science projects. All projects went through two cycles of testing and evaluation. A variety of data was collected including surveys, logbooks, audio recordings of group meetings and notes from lesson observations. The DPs turned out to be viable to a large extent, but finetuning of the lessons was necessary. The design task appeared to be too complex and time-consuming for the teachers involved, partly due to teachers' lack of pedagogical content knowledge although testing the materials and providing feedback contributed to their professionalization. This calls for long-term collaborations in design-based research projects.

Does using real-world contexts in science teaching improve learning? A field study on electricity
Keywords: Instructional Design, Interest, Science and STEM, Secondary Education
Presenting Author: Benedikt Gottschlich, University of Tübingen, Germany; **Co-Author:**Jan-Philipp Burde, University of Tuebingen, Germany; **Co-Author:**Thomas Wilhelm, Goethe University Frankfurt, Germany; **Co-Author:**Liza Dopatka, TU Darmstadt, Germany; **Co-Author:**Verena Spatz, TU Darmstadt, Germany; **Co-Author:**Thomas Schubatzky, University of Innsbruck, Austria; **Co-Author:**Claudia Haagen-Schützenhöfer, University of Graz, Austria; **Co-Author:**Lana Ivanjek, TU Dresden, Germany; **Co-Author:**Martin Hopf, University of Vienna, Austria

During recent decades, many countries observed a diversification of instructional approaches in science teaching in secondary education to foster learning achievement and interest. An example of such a teaching strategy is the use of teaching resources that teach science using illustrative and motivating real-life applications. Researchers agree that such a context-based approach is beneficial for affective factors such as interest but are divided concerning its effects on learning achievements. In a field study, we investigate the effects of context-based teaching with regard to simple electric circuits in physics, which is a topic that is often perceived as abstract and unappealing by learners. We therefore developed a context-based teaching concept for a unit on simple electric circuits for students of year 8. The context-based concept is currently empirically evaluated as part of a field study in order to investigate the effects of context-based teaching on students' learning achievement, interest, and physics-related self-concept. Preliminary results indicate that compared to conventional instruction, the context-based approach leads to higher students' interest and self-concept, with no differences in terms of learning achievements.

Developing and Validating Representational Competence Test to Assess Multiple Representations
Keywords: Assessment Methods, Comprehension of Text and Graphics, Quantitative Methods, Science Education
Presenting Author: Fitria Arifiyanti, University of Szeged, Doctoral School of Education, Hungary; **Co-Author:**Soeharto Soeharto, University of Szeged, Doctoral School of Education, Hungary

Representational competence refers to skills related to generating and using multiple representations and making connections across multiple representations. However, studies related to instrument development to assess representational competence are rarely found in science education. 13 items that measure four different representations, pictorial representation (PR), science representation (SR), mathematics representation (MR), and verbal representation (VR), were developed and named representational competence test (RCT). 584 pre-service science teachers, 279 (47.8%) males and 305 (52.2%), participated randomly from Indonesian universities via the online platform. Rasch measurement was used in the data analysis to perform Rasch modeling using joint maximum likelihood estimation (JMLE). The result showed that RCT is valid and reliable based on Rasch parameters. The mean of Infit and outfit mean square (MNSQ) for the item and person range from 1.00 to 1.01 logits, indicating acceptable fit. For reliability, Cronbach's alpha (α) achieved 0.73, and the item and person reliability for the Rasch model are 0.69 and 0.97 logits, achieving acceptable criteria. No bias issues, all items in the negligible category (DIF A), were found based on DIF analysis regarding gender. The mean logit score of pre-service science teachers' is -0.81 logits, confirming that participants' abilities are under average level (0 logits). Based on gender, there is a significant difference based on t-test statistics where males are better than females. Pre-service science teachers above 25 years old have better mean logits (-0.19) than the two other cohorts, under 21 years old (-0.86) and 21-25 years old (-0.77).

The Use of Formative Peer Assessment as a Scaffold during Inquiry Learning in STEM Education

Keywords: Feedback, Inquiry Learning, Peer Interaction, Science and STEM
Presenting Author: Amber Van Hoe, Ghent University, Belgium; **Co-Author:**Tijs Rotsaert, Ghent University, Belgium; **Co-Author:**Tammy Schellens, Ghent University, Belgium

The inquiry-based learning research field has been investigating the concept of scaffolding for the last fifteen years. However, the potential of formative assessment as a specific form of guidance during inquiry has remained underexplored. The aim of this intervention study was to investigate how peers can be engaged to provide formative assessment to one another during inquiry. In total 524 students of the ninth and tenth grade participated. These students went in pairs through a lesson series of four lesson periods in which they had to investigate climate change. Their investigation was structured by the means of an inquiry cycle. In total three experimental conditions were created. In the first no PA condition, no PA was given. In the second PA condition, quantitative and qualitative peer feedback was given. In the third PA and dialogue condition, the quantitative and qualitative peer feedback was supplemented by a peer dialogue. Our preliminary results indicate a significant positive effect of peer assessment on the quality of the inquiry products of students. During the presentation, an in-depth analysis of the results will be presented. Additionally, the implications of this study for theory and practice will be addressed.

Do we all have the same understanding of subject-specificity in research on teaching quality?
Keywords: Classroom Management, Quantitative Methods, Science Education, Teacher Effectiveness
Presenting Author: Armin Jentsch, University of Oslo, Norway

In current papers on learning and instruction, it is often demanded that research on teaching quality should also take into account the specifics of the school subjects that are investigated. In particular, scholars often discuss to what extent interdisciplinary (generic) models or measures can benefit from a subject-specific enrichment (e.g., through subject matter didactics). From these reflections various conceptions of subject specificity emerge, which have hardly been discussed so far. However, they might have consequences for interdisciplinary research programs on teaching quality. In the presentation, this desideratum will be addressed. First, examples from the literature will show that educational researchers use different conceptions of subject specificity in their respective studies. The term subject specificity can refer equally to theoretical models, operationalization, measurement, or to the effects of teaching quality on student learning. Secondly, we discuss some open research questions that future interdisciplinary research programs on teaching quality could address. In the presentation, we will examine various ideas how research on teaching quality might be informed by subject matter didactics, and at the same time foster interdisciplinary collaborative projects.

Session M 19

25 August 2023 12:00 - 13:30
UOM_A13
Single Paper
Learning and Social Interaction, Teaching and Teacher Education

Teachers' Socio-emotional Competencies and Motivational Beliefs

Keywords: At-risk Students, Emotion and Affect, Higher Education, In-service Teachers, Inclusive Education, Mindsets, Pre-service Teachers, Primary Education, Self-concept, Self-efficacy, Teacher Efficacy, Teacher Professional Development
Interest group: SIG 08 - Motivation and Emotion, SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Barbara Gasteiger-Klicpera, University of Graz, Austria

Social-emotional competencies of Austrian primary school teachers
Keywords: At-risk Students, In-service Teachers, Inclusive Education, Primary Education
Presenting Author: Barbara Gasteiger-Klicpera, University of Graz, Austria; **Co-Author:**Christina Oswald, University of Graz, Austria; **Co-Author:**Lisa Paleczek, University of Graz, Austria

Since students with social, emotional or behavioural difficulties (SEBD) are often rejected by their classmates, it is important to promote their social relationships and their participation at school. The ability of enhancing social relationships in class may depend on teachers' emotional competence, mindfulness and relational skills. The aim of the present study was to investigate the interaction between these abilities of teachers and their strategies to foster the social participation of students with SEBD. We collected data on 148 Austrian primary school teachers' mindfulness in teaching, emotional self-efficacy, and relational competence using an online survey. To build a bridge between teachers' competencies and the implementation of inclusive education of students with disabilities in primary school, teachers were also asked about strategies they apply to promote the social participation of students with SEBD. To that end, the research team translated standardised scales from English to German. Respondents were predominantly female (95.9%), with a mean age of 45.52 years (*SD* = 11.39, range = 20–64 years). Results show that teachers rated their mindfulness in teaching, their emotional self-efficacy, and their relational competence as good. To promote the social participation of students with SEBD, teachers reported using more direct than indirect strategies. Preliminary findings indicate a relationship between teachers' interpersonal mindfulness, their relational competence and the number of direct strategies used to foster the social participation of students with SEBD. In summary, our findings highlight the impact that teachers´ social-emotional competencies can have on students' development.

Implicit theories of intelligence in German student teachers
Keywords: Higher Education, Mindsets, Self-concept, Teacher Professional Development
Presenting Author: Franziska Frohberg, Universität Leipzig, Germany; **Co-Author:**Christin Lotz, University Leipzig, Germany; **Co-Author:**Anne Deiglmayr, University of Leipzig, Germany

Learners´ implicit beliefs about intelligence (i.e., learners´mindset) affect motivation and learning (Blackwell et al., 2007). In addition, teachers' implicit beliefs about their students' intelligence (student-related mindset) have an important impact on student learning (Yeager et al., 2021). The research project presented here aims to capture German student teachers' implicit theories of intelligence (both in general, and towards their students) and to analyze their relationship to wider teaching-related attitudes and beliefs. In an online survey, 523 student teachers across all school types and subjects answered questions addressing their general and student-related mindsets, as well as other teaching-related beliefs and attitudes. Moreover, we compared the direct translation of intelligence ("Intelligenz") to a more open term ("grundlegende Fähigkeiten"; basic skills) in a between-subject and within-subject experimental design. Although results showed no between-subject mean differences in the mindset scores between the two translation variants, the within-subject intercorrelation between the translation variants was of only medium size (r = .42), indicating that they do indeed tap into different connotations. Additionally, general mindset and student-related mindset were highly and positively correlated (r = .78). We found different patterns of correlations between general and student-related mindset scores with other teaching-related beliefs and attitudes. However, all correlations were of small size ($r \leq .20$).

Changes in student teachers' self-efficacy and relations to emotion words in written reflections
Keywords: Emotion and Affect, Pre-service Teachers, Self-efficacy, Teacher Efficacy
Presenting Author: Anja Henke, University of Potsdam, Germany; **Co-Author:**Andrea Westphal, Universität Greifswald, Germany; **Co-Author:**Isabell Hußner, University of Potsdam, Germany; **Co-Author:**Rebecca Lazarides, University of Potsdam, Germany

Positive relations between positive emotions, learning outcomes and self-efficacy beliefs – as suggested by Control-Value Theory – have been shown in school children. It is unclear, however, if this relationship generalizes to the field of teacher education. Analyzing N = 239 written reflections from N = 146 student teachers, this study aims to examine relations between student teachers' teaching-related self-efficacy beliefs (TRSEB) and their use of emotion words when reflecting on positive and challenging situations of a microteaching experience. We hypothesized that student teachers' emotion word use differs between reflections on positive and challenging situations. We further hypothesized that their use of positive emotion words would be positively associated with their TRSEB whereas the use of negative emotion words would negatively relate to TRSEB. Wald-Tests showed that student teachers generally use more positive

than negative emotion words. Moreover, they used more positive emotion words when reflecting on a positive situation and more negative emotion words when reflecting on a challenging situation. Path models indicated that student teachers who used more negative emotion words in reflections on positive teaching situations reported lower TRSEB. We found no significant associations between TRSEB and positive emotion word use when reflecting on challenging situation nor between TRSEB and negative emotion word use. Thus, our results suggest that assumptions of Control-Value Theory are transferable to teacher education. Furthermore, they emphasize the necessity to consider emotions in learning contexts and underline their potential for pedagogical diagnosis and designing systematic interventions improving student teachers' TRSEB by accurately perceiving mastery experience.

Session M 20

25 August 2023 12:00 - 13:30
UOM_R08
Single Paper
Teaching and Teacher Education

Eye Tracking Studies in Teacher Professional Development

Keywords: Classroom Management, Eye Tracking, Meta-analysis, Mixed-method Research, Quantitative Methods, Reasoning, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 11 - Teaching and Teacher Education, SIG 27 - Online Measures of Learning Processes
Chairperson: Kasia Banas, University of Edinburgh, United Kingdom

Perceptions of classroom disruptions among (prospective) teachers: a mixed methods approach
Keywords: Classroom Management, Eye Tracking, Mixed-method Research, Teacher Professional Development
Presenting Author: Ann-Sophie Grub, Saarland University, Germany; **Co-Author:**Roland Bruenken, Saarland University, Germany; **Co-Author:**Doris Lewalter, Technical University of Munich (TUM), Germany; **Co-Author:**Antje Biermann, Saarland University, Germany

Teachers' professional vision is characterized by noticing relevant events in the classroom. Previous studies demonstrated differences in gaze behavior between prospective and experienced teachers under certain conditions. Most study results are based exclusively on eye-tracking data, the sole validity of which is limited by the eye-mind hypothesis. A direct triangulation of eye-tracking data and corresponding verbal data has been done by Wyss et al. (2021). As in this study, we used a mixed-methods approach to student and experienced teachers' (N=52) perception of classroom situations, whereby eye-tracking data and qualitative verbal data were linked in the sense of triangulation. We investigated whether critical incidents (CI) that were deemed relevant while watching the videos were also mentioned in verbal data. Results show a discrepancy between eye-tracking and verbal data: CIs were significantly more likely to be mentioned in the retrospective think-aloud than to be responded to with a keypress. Furthermore, we investigated whether there were differences in terms of expertise as well as between individuals who perceived the CI in the videos (respondents) and those who did not (non-respondents). Expertise differences were not revealed, but respondents were found to have more pronounced monitoring gaze behavior than non-respondents. The study thus highlights the relevance of triangulation in the use of eye-tracking, as it allows supplementation and possible correction by verbal data. Furthermore, the results show that teaching experience is not the sole determinant of professional vision, but that student teachers also appear to be able to monitor effectively when watching classroom videos.

Teachers' stress influences the effect of visual focus of attention on child-centred practices
Keywords: Eye Tracking, Quantitative Methods, Teacher Professional Development, Teaching/Instructional Strategies
Presenting Author: Anna-Liisa Jõgi, Tallinn University, Estonia; **Presenting Author:**Saswati Chaudhuri, University of Jyväskylä, Finland; **Co-Author:**Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

Teachers' visual attention on students and its distribution are related to their implementation of child-centred teaching practices in the classroom. Additionally, teacher's stress also affects teaching practices. The aim of the present study was to investigate the effect of teachers' stress on the relationship between teacher's visual focus of attention and teaching practices in Grade 1 classrooms. The measures included eye-tracking video recordings from classroom teachers (N = 48) during one lesson; physiological stress using salivary cortisol levels, psychological stress using self-reported questionnaire, and observed teaching practices during one school day. Results showed that, firstly, teacher's visual focus of attention on students (fixation counts and Gini coefficient) were related to using more child-centred than teacher-directed practices. Secondly, only lower self-reported psychological stress was related to the child-centred practices, while high psychological stress did not show direct effect on teaching practices. Thirdly, interaction analyses showed that both psychological and physiological stress moderated the relation between teachers' visual focus of attention and teaching practices. More specifically, relationship between teachers' visual focus of attention on students and implementing child-centred practices appeared only for less stressed teachers. Higher stressed teachers used less child-centred teaching practices irrespective of the amount of visual focus of attention towards the students. The results suggest that for low stressed teachers the visual focus of attention reflects in their child-centred teaching practice. Practical implications of this study suggest that teachers should receive support to reduce stress, encourage more child-centred teaching practices, and provide individualized attention to students.

Pipelines and initial reports from machine learning classification of teacher gaze in the classroom
Keywords: Eye Tracking, Quantitative Methods, Teacher Professional Development, Teaching/Instructional Strategies
Presenting Author: Nora McIntyre, University of Southampton, United Kingdom

Mobile eye-tracking studies have the potential to provide contextually relevant insights into the practice of classroom instruction. However, the most insightful data involves long recording durations across multiple individuals (i.e., teachers) — and preferably with the teacher interacting with students during the classroom scenario. A hindrance to implementing research with this angle is the sheer volume of labour that it requires. With automated techniques and tools becoming available, this study subjected pre-existing mobile eye-tracking data to such automated analytic tools with a focus on the role of culture-specific expertise on teachers' gaze sequences (RQ1), as well as the role of teacher cognition in mutual gaze shared by teachers and students. In accordance with existing, related analyses (McIntyre & Foulsham, 2018) differences in communicative teacher gaze sequences are expected to depend on the combination of culture with expertise, whereas differences in attentional teacher gaze sequences will depend on expertise alone as well as that culture combined with it.

A Meta-Analytic Review of Eye-Tracking Studies to Investigate Teachers' Professional Vision
Keywords: Eye Tracking, Meta-analysis, Reasoning, Teacher Professional Development
Presenting Author:Özün Keskin, University of Augsburg, Germany; **Co-Author:**Andreas Gegenfurtner, University of Augsburg, Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany; **Co-Author:**Kathleen Stürmer, Univerity of Tübingen, Germany

A key skill for successful teaching is teacher professional vision, defined as the ability of teachers to notice and reason about relevant classroom situations. In the last few years, past research explored teacher professional vision with eye tracking to record teachers' eye movements during teaching events and make them accessible for further analyses. However, previous studies show a massive heterogeneity in terms of theory, methodology, and results. Therefore, we aimed to conduct a systematic literature review for creating an overview of eye tracking-studies examining teacher professional vision. A total of 65 studies were included in our review. We analyzed the studies descriptively by screening for theoretical, methodological, and outcome related characteristics. Our findings indicate heterogeneity in all three characteristics. Furthermore, our results may allow for better characterization of expertise development in classroom situations and provide a framework for future eye-tracking research of teachers' professional vision. The outcomes of this review add to the examining of teacher professional vision. Implications for future research on teacher professional vision are to develop the fundamental theory with the aim to imply further development in teacher education and be useful in teacher professional development.

Session M 21

25 August 2023 12:00 - 13:30

UOM_A07
Single Paper
Assessment and Evaluation, Higher Education, Instructional Design, Learning and Instructional Technology

Technology-enhanced Learning and Instruction: Factors That Matter

Keywords: Assessment Methods, Cognitive Skills and Processes, Critical Thinking, Digital Literacy and Learning, Educational Technologies, Engagement, Higher Education, Large-scale Assessment, Mixed-method Research, Quantitative Methods, Reading, Self-efficacy, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 01 - Assessment and Evaluation, SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Sunet Grobler, Austria

Adapting the Technological Pedagogical and Content Knowledge (TPACK) survey for higher education
Keywords: Educational Technologies, Higher Education, Quantitative Methods, Teacher Professional Development
Presenting Author: Ha Nguyen, University of Groningen, Netherlands; **Co-Author:**Jolien Mouw, University of Groningen, Netherlands; **Co-Author:**Angeliki Mali, University of Crete, Greece; **Co-Author:**Hanke Korpershoek, University of Groningen, Netherlands; **Co-Author:**Jan-Willem Strijbos, University of Groningen, Netherlands

Measuring and monitoring teachers' competencies in teaching with technology is essential for higher education institutions to provide appropriate support and professional development activities, on the way to achieve effective online/blended/hybrid education. The Technological Pedagogical and Content Knowledge (TPACK) model distinguishes seven key factors: technological knowledge (TK), technological pedagogical knowledge (TPK), pedagogical knowledge (PK), pedagogical content knowledge (PCK), content knowledge (CK), technological content knowledge (TCK), and technological pedagogical and content knowledge (TPCK). Although frequently used to measure teachers' competencies in teaching with technology, existing TPACK surveys have mostly been used for pre-service or K-12 teachers. Few of the existing TPACK surveys have specifically been developed for university teachers. Hence, this study set out to construct a TPACK survey for higher education in the context of online/blended/hybrid education. Through reviewing the existing surveys and systematically scrutinizing their subscales and items, as well as adaptation and contextualization, we developed a TPACK survey adapted to higher education. Our adapted TPACK survey consists of 31 items distributed across 7 subscales. Each item is rated on a 5-point Likert-scale ranging from 1 (strongly disagree) to 5 (strongly agree). Results from our study indicate that (a) the subscales are sufficiently internally consistent and (b) the items fit the TPACK constructs as operationalized in the seven-factor model.

TPACK and the design of teaching against misinformation in five school subjects
Keywords: Critical Thinking, Digital Literacy and Learning, Mixed-method Research, Teaching/Instructional Strategies
Presenting Author: Thomas Nygren, Uppsala University, Sweden; **Co-Author:**Malin Tväråna, Uppsala University, Sweden, Sweden; **Co-Author:**Carl-Anton Werner Axelsson, Uppsala University, Sweden

We investigate how teaching in practice can stimulate students to become better at handling digital information critically and constructively, in different contexts. In the form of a design study where professional teachers and researchers together develop and test different arrangements in teaching, we examine the question of how varying materials and teaching methods can support students' digital source criticism in five different school subjects, namely, history, civics, art, psychology and biology. Teachers technological pedagogical content knowledge (Mishra & Koehler, 2006) is at the core of the design iterations aimed at investigating educational innovative designs with a positive impact in ordinary messy classrooms. The results highlight how TPACK reflections in relation to design iterations may promote students' abilities to identify, evaluate and use digital information in critical and constructive ways in different school subjects. We also present and discuss what students learn and struggle to learn in the five subject specific settings in light of research highlighting the importance of digital civic literacy.

The Interplay Between Technology-Enhanced Item Formats and Test-Taker Cognition
Keywords: Assessment Methods, Cognitive Skills and Processes, Large-scale Assessment, Reading
Presenting Author: Burcu Arslan, ETS Global, Netherlands; **Co-Author:**Blair Lehman, ETS, United States; **Co-Author:**Madeleine Keehner, ETS, United States; **Co-Author:**Marlit Annalena Lindner, IWM - Leibniz-Institut für Wissensmedien, Universität Tübingen, Germany

Computer-based assessments frequently use technology-enhanced item formats (e.g., drag-and-drop, inline-choice) for item types, such as ordering (sequencing), due to their potential to better represent knowledge, skills, and abilities of test-takers in a more authentic way compared to multiple-choice items. Currently, decisions about choosing an item format are based on experts' judgments rather than empirical evidence and theory about the effects of different item formats on test-taker performance and cognition. Lack of evidence-based and theoretically-grounded decisions threaten the validity of the interpretation of student knowledge, skills, and abilities. To provide theoretically-grounded empirical evidence on the appropriate use of item formats, we conducted a within-subject, randomized, controlled experimental study in which 535 eighth-grade students were tested with three reading comprehension items. We present the findings of the study together with their implications.

Both quantity and quality of technology integration matter
Keywords: Educational Technologies, Engagement, Quantitative Methods, Self-efficacy
Presenting Author: Tessa Consoli, University of Zurich, Institute of Education, Switzerland; **Co-Author:**Maria-Luisa Schmitz, Institute of Education, University of Zurich, Switzerland; **Co-Author:**Chiara Antonietti, Swiss Federal University for Vocational Eduation and Training (SFUVET), Switzerland; **Co-Author:**Dominik Petko, University of Zurich, Switzerland; **Co-Author:**Alberto Cattaneo, Swiss Federal University for Vocational Education and Training, Switzerland; **Co-Author:**Philipp Gonon, Institute of Education, University of Zurich, Switzerland

In this study, we developed a short survey instrument to assess the perceived quality of teaching with technology from the students' perspective based on the Three basic dimensions of teaching quality framework. According to this framework, cognitive activation, classroom management, and student support are three essential and indispensable dimensions of teaching quality. Several empirical studies demonstrated that these dimensions positively impact students' learning outcomes. Based on survey data from N = 8'915 students of 108 upper secondary schools in Switzerland, we investigated whether the frequency and quality of technology use (i. e., the use of technology to sustain the three dimensions of teaching quality) affect students' academic engagement and students' self-efficacy toward learning with technology. Hierarchical multiple regression analyses found a statistically significant small positive effect of the quality of technology use on students' learning engagement and statistically significant small positive effects of both frequency and quality of technology use on student self-efficacy toward learning with technology. The results emphasize the importance of considering the quality and quantity of technology integration and different learning outputs. In addition, the newly developed short survey instrument for assessing the quality of technology use in classrooms in large-scale survey studies can be considered a valid instrument and an important step in further investigating these issues.

Session M 22

25 August 2023 12:00 - 13:30
AUTH_T102
Single Paper
Motivational, Social and Affective Processes, Teaching and Teacher Education

Teacher Enthusiasm

Keywords: Assessment Methods, Emotion and Affect, Engagement, Higher Education, In-service Teachers, Mathematics/Numeracy, Motivation, Pre-service Teachers, Secondary Education, Teacher Professional Development
Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education

Chairperson: Antti Laherto, University of Helsinki, Finland

How to become an enthusiastic teacher?–Motivational antecedents in early stages of teacher education
Keywords: Higher Education, Motivation, Pre-service Teachers, Teacher Professional Development
Presenting Author: Christin Lotz, University Leipzig, Germany; **Co-Author:**Patrick Hawlitschek, Institute for Educational Quality Improvement (IQB), Germany; **Co-Author:**Anne Deiglmayr, University of Leipzig, Germany

Teacher enthusiasm is the enjoyment, excitement, and pleasure (a) experienced during *teaching* and (b) for the *subject* taught. It is a highly relevant aspect of teachers' professional competences (Kunter et al., 2011). Whereas most prior studies showed the importance of teacher enthusiasm for effective teaching (e.g., Kunter et al., 2013), only little is known about the factors that shape teacher enthusiasm, especially during the early stages of teacher education. Thus, this longitudinal study investigated (1) how motivational aspects for choosing to study teacher education relate to teacher enthusiasm and (2) whether teacher self-concept explains the motivation-enthusiasm relations.A sample of *N*=671 second-semester teacher education students provided data at two measurement points: Motivation for choosing to pursue a teaching degree at the beginning of the semester and teacher self-concept as well as teacher enthusiasm after completing a mandatory internship in school about six months later. Results of structural equation models indicated that particularly intrinsic motives predicted later teacher enthusiasm. Specifically, educational interest showed a closer connection to teaching enthusiasm, whereas subject interest predicted subject enthusiasm more pronouncedly. Latent mediation models revealed different paths from students' motives to teacher enthusiasm: (a) The relation between educational interest and teaching enthusiasm was explained by education-specific self-concept but not by subject-specific self-concept; (b) the relation between subject interest and subject enthusiasm was explained by subject-specific self-concept but not by education-specific self-concept. Thus, it appears as if different mechanisms are involved in the relation between motivational antecedent and teaching as well as subject enthusiasm.

Influence of students' performance and teachers' enthusiasm on teachers' use of engaging messages
Keywords: Assessment Methods, In-service Teachers, Secondary Education, Teacher Professional Development
Presenting Author: Samuel Falcón, University of Las Palmas de Gran Canaria, Spain; **Co-Author:**Jaime Leon, University of Las Palmas de Gran Canaria, Spain; **Co-Author:**Wilfried Admiraal, Oslo Metropolitan University, Centre for the Study of Professions, Norway

The current study examined how students' performance and teachers' enthusiasm influence teachers' use of engaging messages in class. These messages can focus on benefits or disadvantages of being engaged in a school task, and appeal to external (i.e., extrinsic, or introjected) or internal (i.e., identified, or intrinsic) incentives to get students to engage. Engaging messages were gathered through audio-recorded lessons of 39 teachers in 59 student groups during the second term of the academic year. Results showed that both students' performance and teachers' enthusiasm influence teacher's use of engaging messages. The better the students' performance and the higher the teachers' enthusiasm, the larger the number of messages used. Moreover, the better the students' performance, the greater the likelihood of using messages that appeal to extrinsic incentives. By assessing engaging messages through objective observations, we discovered relationships that can help us better understand teachers' use of engaging messages. The findings also provide the insights for the design of future interventions aimed at modifying teachers' use of engaging messages. Aiming interventions at teachers instead of students has already proven to be efficient, as a single teacher may teach hundreds of students. An effective way to change teachers' behaviour is through interventions aimed at self-awareness of their practices. Therefore, providing them with feedback on their use of engaging messages may be a satisfactory option, as it is objective and simple for teachers to understand.

Promoting student enthusiasm: The role of teacher enthusiasm, teaching methods and time schedule
Keywords: Emotion and Affect, Engagement, Mathematics/Numeracy, Secondary Education
Presenting Author: Eline Camerman, KU Leuven, Belgium; **Co-Author:**Jeroen Lavrijsen, KU Leuven, Belgium; **Co-Author:**Peter Kuppens, KU Leuven, Belgium; **Co-Author:**Karine Verschueren, KU Leuven, Belgium

Students' enthusiasm at school constitutes an important facet of their school engagement, which has consistently been related to higher academic achievement and better socio-emotional adjustment. According to crossover theory (Härtel & Page, 2009) and empirical findings on emotional crossover in academic settings, students' enthusiasm in class may directly or indirectly result from the enthusiasm of their teachers. In addition, time schedule and teaching characteristics such as teaching methods have been suggested to play a significant role in students' emotional experiences in school. In the present study, we aimed to examine whether momentary levels of student and teacher enthusiasm in real-life classes are interrelated over time. Furthermore, we explored the role of teaching methods (i.e., oral instruction, group work, independent work or classroom discussion) in students' in-class enthusiasm and whether student enthusiasm depends on the day of the week or time of the day. To address these aims, an experience sampling study was conducted, in which both teachers and students reported on their momentary levels of enthusiasm and teaching methods twice during mathematics classes for a two-week period. Although the sample is currently being expanded, findings indicate positive relations between student and teacher enthusiasm over time and show higher levels of student enthusiasm during group work, independent work and at the end of the week. The present examination sheds light on the importance of promoting positive emotions in teachers as these may not only contribute to teachers' overall well-being, but also relate to students' emotional experiences and engagement in school.

Session M 23

25 August 2023 12:00 - 13:30
UOM_R03
Poster Presentation
Cognitive Science, Higher Education, Instructional Design, Learning and Instructional Technology, Lifelong Learning

Digital Literacy and Learning

Keywords: Critical Thinking, Digital Literacy and Learning, Educational Technologies, Eye Tracking, Higher Education, Immersive Technologies for Learning, Inclusive Education, Instructional Design, Learning Analytics, Lifelong Learning, Mixed-method Research, Multimedia Learning, Reasoning, Secondary Education, Teaching Approaches, Teaching/Instructional Strategies, Writing/Literacy
Interest group: SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 12 - Writing, SIG 14 - Learning and Professional Development, SIG 27 - Online Measures of Learning Processes
Chairperson: Marjaana Puurtinen, University of Turku, Finland

The Changing Demands on Diverse Faculty's Digital Competence in Hybrid Learning Environments
Keywords: Digital Literacy and Learning, Higher Education, Inclusive Education, Teaching/Instructional Strategies
Presenting Author: Natalia Auer, Malmö University, Sweden; **Co-Author:**Katherine Doerr, Faculty of Education and Society, Malmö University, Sweden

The aim of this study is to examine the enduring impact of digital competence on university educators' practices. The COVID-19 pandemic accelerated higher education's shift to digitization as universities adopted emergency remote teaching. While educators digitized their teaching in only few days, there is a significant difference between the quality of instruction of a well-designed online course and courses offered online in response to the health crisis. In the aftermath of this crisis, is important to characterize educators' digital competences for several reasons. These include to empower their use of learning technology, to support their teaching in innovative ways, and to ensure accessibility to learning resources and activities to all learners, including those with special needs. To do this, we turn to the research-based European Framework for the Digital Competence of Educators (DigCompEdu). DigCompEdu's purpose is to develop teacher digital competences and take advantage of learning technology to improve and innovate education. DigCompEdu provides the framework for qualitative analysis of data collected from lesson observations and interviews with university educators (n= ~30). The study participants, faculty at one university in Scandinavia, represent a diverse range of disciplines, genders, and other social categories. The significance of this research is both theoretical and applied. It increases knowledge of how educators develop their digital competences and take advantage of learning technologies to innovate. In addition, it supports inclusive education, as students' need to become digitally competent depends on educators' development of their own digital competence.

What happens when the Novelty wears off? An empirical investigation of learning with Virtual Reality
Keywords: Digital Literacy and Learning, Educational Technologies, Immersive Technologies for Learning, Multimedia Learning
Presenting Author: Sara Klingenberg, University of Copenhagen, Denmark; **Co-Author:**Guido Makransky, University of Copenhagen, Denmark

What happens when the novelty wears off? Does immersive Virtual Reality (VR) fundamentally transform the way learners experience educational content, or are previous results supporting the use of this technology simply a reflection of novelty and framing effects? To investigate, we conducted a 2 x 3 between-subjects VR experiment with first-year university students on the topic of biochemistry. We manipulated novelty by allowing half of the students to use VR before the lesson, and we manipulated framing by introducing students to either positive, neutral, or negative evidence of the value of using VR in science education prior to the lesson. Results showed an increase in knowledge from pre- to post-test across groups, but the differences between conditions were not significant. Compared to the novice groups, students familiar with VR had significantly better in-game performance, perceived the lesson as more difficult and reported higher intrinsic cognitive load, but there were no differences between the groups on perceived effort, usability, satisfaction, or other cognitive load variables. There were no differences between the framing conditions on any of the outcome variables. This suggests that learning outcomes may not be directly affected by novelty nor framing effects, and that an attempt to predispose students to taking a particular stand on the use of immersive learning was overshadowed by the actual embodied learning experience, although familiarity with VR may influence other variables related to learning.

(How) can word processors improve writing in secondary classes? Results of an Intervention Study.
Keywords: Digital Literacy and Learning, Instructional Design, Secondary Education, Writing/Literacy
Presenting Author: Viktoria Michels, Universität zu Köln/ University of Cologne, Germany; **Co-Author:**Till Woerfel, Mercator Institute for Language and Literacy Education, Germany; **Co-Author:**Michael Becker-Mrotzek, Mercator Institute for Language and Literacy Education, Germany

The international assessment ICILS 2018 shows that word processors are among the most frequently used digital tools in German classrooms. Empirical studies show, however, that the use of writing software in classroom only has a positive impact on text production if it has previously been taught to learners in a suitable learning environment, which integrates writing and revision processes. This paper presents an ongoing non-randomized controlled interventional study with pre-post-follow-up-design, which aims to find out how students' digital texts in secondary schools are affected by word processor tools (spell check, synonym dictionary, speech synthesis) being part of a comprehensive learning environment. The paper will discuss preliminary findings in the different writing conditions: paper-pencil and tablet and keyboard.

Visual behavior of students differing in justification beliefs when reading conflicting reports
Keywords: Critical Thinking, Digital Literacy and Learning, Eye Tracking, Learning Analytics
Presenting Author: Meng-Jung Tsai, National Taiwan Normal University, Taiwan; **Co-Author:**Ching-Yeh Wang, National Kaohsiung University of Hospitality and Tourism, Taiwan; **Co-Author:**An-Hsuan Wu, National Taiwan Normal University, Taiwan; **Co-Author:**Ivar Bråten, University of Oslo, Norway

This study explored the role of students' justification beliefs when reading two conflicting socio-scientific reports. Forty-six university students volunteered to complete the reading task while their eye movements were tracked and recorded. A pre- post-test design was used to examine students' justification beliefs, critical reading strategies, and reading performance in terms of recall and critical reflection. Cluster analysis was used to classify participants into three groups (Personal-Multiple, Authority-Multiple, Multiple) based on their scores on three dimensions of justification beliefs (Personal Justification, Justification by Authority, Justification by Multiple Sources). Then, lag sequential analysis was conducted to explore visual transitions between the conflicting texts for each group. The results indicated that only the Multiple group displayed a visual pattern consistent with linking information across the two conflicting reports. Except for the Authority-Multiple group, all participants reportedly used an upper to medium level of critical reading strategies during the reading task and critical reflection was observed in all three groups. However, only the Multiple group recalled information from the two conflicting reports in a balanced way. The results of this study uncovered relations between students' justification beliefs and their processing of conflicting information and, as such, they may suggest scaffolds to improve critical thinking during online reading.

Regular media use and learning effects on the ability to critically reason with digital media
Keywords: Critical Thinking, Digital Literacy and Learning, Higher Education, Reasoning
Presenting Author: Dominik Braunheim, Johannes Gutenberg-Universitaet, Germany

While the need of being able to differentiate reliable from unreliable information vastly precedes our contemporary society, the scope of avaiable information is continously increasing, making this task more difficult (Lewandowsky et al., 2012). The internet is becoming a necessity not online during day to day information acquisition, but also for the purposes of learning in higher education (HE), where student's seem to struggle with both source and content evaluation on the medium (McGrew et al., 2018). The reliance on faulty, vague or even manipulative sources not only bears risks to the formation of opinions, but also on the quality of HE learning and especially its outcomes (Maurer et al., 2018). This pitfall raises the need for a better undertanding of how students can increase their ability to navigate and appraise digital media content correctly on their own. This paper addresses how previous experiences in media use, in a professional setting, are connected to the ability to navigate digital media content and form consise arugments based on the respective findings. In a two-step process both the patterns in regular media use and their influence on the ability to critically reason with online media (COR) (Molerov et al., 2020) will be described based on an empirical sample of young professionals at the intersection between HE and their first years of practice (N = 144).

Designing for learning in the digital transformation: a design-based research
Keywords: Digital Literacy and Learning, Lifelong Learning, Mixed-method Research, Teaching Approaches
Presenting Author: Monique Docter, University of Twente, Netherlands; **Co-Author:**Maaike Endedijk, University of Twente, Netherlands

As Digital Transformation can be considered as a fundamental change process in organizations, the fast technological developments ask for a broad range of formal and informal learning activities to keep employees employable. This poster describes the outcomes of a design-based research project to transform a traditional teacher-led formal course on Digital Transformation to a learning solution in which more self-directed formal and informal learning is integrated. This research project was a co-creation between three public and private organizations and a University with the ambition to accelerate the development of large groups of employees along the digital transformation, making knowledge and skills of business & IT, data science, ethics and cyber security as their core competencies. The course was redesigned based on three design requirements: 1) accommodating great diversity in the group of participants, 2) integrating the theory and the organizational practice, and 3) stimulating learning as a continuous process. The course was designed in three iterations and results now in a flip the classroom approach with a focus on the personal learning path of the learner, and the application of what is learned in their daily work. Data collection reveals insights in how the new design is perceived by the learners, as well as the learning outcomes of the course on the individual learners and the organization as a whole.

Session M 24

25 August 2023 12:00 - 13:30
UOM_R02
Poster Presentation
Assessment and Evaluation, Instructional Design, Learning and Social Interaction, Teaching and Teacher Education

Supporting Early Childhood Education

Keywords: Assessment Methods, Attitudes and Beliefs, Classroom Assessment, Curriculum Development, Developmental Processes, Early Childhood Education, Feedback, In-service Teachers, Instructional Design, Meta-analysis, Mixed-method Research, Quantitative Methods, School Effectiveness, School Leadership, Teacher Professional Development, Tool Development
Interest group: SIG 01 - Assessment and Evaluation, SIG 05 - Learning and Development in Early Childhood
Chairperson: Victoria Johansson, Kristianstad University, Sweden

Supporting knowledge transfer in early childhood education – a longitudinal evaluation study
Keywords: Early Childhood Education, Mixed-method Research, School Leadership, Teacher Professional Development
Presenting Author: Daniela Ulber, HAW Hamburg, Germany; **Co-Author:**Nina Hogrebe, University of Applied Sciences Hamburg, Germany; **Co-Author:**Valerie Bergmann, HAW Hamburg, Germany

The sustainable transfer of new knowledge and competences into daycare centers is central for organizational development in early education, but research indicates that organizational development is not a task daycare center leader consider as their explicit responsibility (Timmermann et al., 2021) and is often not sufficiently supported by higher levels of the system (Hogrebe et al., 2012). Understandings of leadership that take team members into account, i.e. transformational leadership, empowerment and shared leadership, (e.g. Kangas et al., 2016; Siraj-Blatchford & Hallet, 2014; Rodd, 2015, Talan et al., 2014, Wang et al., 2014) as well as holistic approaches like the "whole systems approach" in Denmark (Hansen, 2018) seem especially promising but are quite demanding.The central aim of the study is to evaluate the implementation and effectiveness of an intervention that has been developed by a German Foundation to support knowledge transfer into daycare centers and foster organizational development. We use a mixed-method research design in which quantitative and qualitative methods are combined. First, we conduct quantitative online-surveys with early educators that participated in a professional development training and their center leaders at three measurement points (n=23). Second, we conduct expert interviews with these educators and leaders as well as additional team members (t 4). On the basis of the evaluation findings we can derive useful insights on how to support staff in early education in team transfer processes and organizational development more general.

Cross-cultural differences in preschool teachers' perceptions of teacher-child emotional dependency
Keywords: Attitudes and Beliefs, Early Childhood Education, In-service Teachers, Quantitative Methods
Presenting Author: Sofie Hendrix, KU Leuven, Belgium; **Co-Author:**Jantine Spilt, KU Leuven, Belgium; **Co-Author:**Joana Cadima, University of Porto, Portugal; **Co-Author:**Ana Camacho, University of Porto, Portugal; **Co-Author:**Tiago Ferreira, University of Porto, Portugal; **Co-Author:**Athanasios Gregoriadis, Aristotle University of Thessaloniki, Greece; **Co-Author:**Helma Koomen, Research Institute of Child Development and Education, Netherlands; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland; **Co-Author:**Andrea Eva Otero Mayer, National Distance Education University, Spain; **Co-Author:**Iwona Omelanczuk, Faculty of Education, University of Warsaw, Poland; **Co-Author:**Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Jochem Thijs, University Utrecht, Netherlands; **Co-Author:**Olga Wysłowska, Faculty of Education, University of Warsaw, Poland; **Co-Author:**Karine Verschueren, KU Leuven, Belgium

Previous research often indicates that teacher-student dependency is a negative dimension of the teacher-student relationship. However, most of this research has been conducted in cultures described as individualistic (or independent). The scant research in more collectivistic (or interdependent) countries suggests that dependency may be a more positive relationship quality. Although these cross-country differences have been attributed to differences in cultural values, this hypothesis has not been tested directly. Additionally, some scholars hypothesize that dependency has different subdimensions. Specifically, two subtypes of emotional dependency – the type of dependency that is mostly measured - have been distinguished. No research to date has studied whether the perceptions of teachers differ for these subtypes. To address these gaps, the present study examines (a) the association between teachers' perceptions of teacher-student emotional dependency and cultural values and (b) if the perceptions of teachers differ for the two subtypes of dependency. Participants will be recruited in seven European countries that differ in the degree of independence/interdependence (i.e., Belgium, Poland, Greece, Portugal, Netherlands, Finland and Spain). The study will use a within-participant vignette design, with one vignette for each subtype of emotional dependency. First findings will be presented at the EARLI conference. In this study we try to provide explanations for cross-country differences in teacher perceptions of emotional dependency to understand under what conditions dependency can be either a developmental risk factor or a facilitative factor in this development.

Effect of childcare teachers' positions on their attribution of responsibility for problems.
Keywords: Early Childhood Education, In-service Teachers, Quantitative Methods, School Leadership
Presenting Author: Maori Urakawa, Nagasaki Junshin Catholic University, Japan

Early resignation of childcare teachers is an important problem in early childhood education in Japan. One of the reasons is the problem of human relations in the workplace. The directors who manage the organization must create an environment in which childcare teachers can work comfortably. Therefore, this study aims to clarify how childcare teachers think about the attribution of responsibility in situations where they have problems with children, and how they differ from chiefs and directors.Methods: Subjects: 102 childcare teachers in various positions. Questionnaire survey by position (director/chief teacher/assistant chief/teacher). A case study of a child with developmental disorder was presented to determine whether the attribution of responsibility to the teacher in charge varied by position.RESULTS AND DISCUSSION: Compared to the directors and chief teachers, assistant chiefs and childcare teachers felt that the childcare teachers were more responsible ((F(2,94)=6.751 p

The Relationship between Educator-Child-Ratio and Pedagogical Quality in ECEC Explained
Keywords: Classroom Assessment, Early Childhood Education, Meta-analysis, School Effectiveness
Presenting Author: Kristina Hausladen, Otto-Friedrich-University Bamberg, Germany; **Co-Author:**Katrin Wolf, Otto-Friedrich-University of Bamberg, Germany

It is important to provide children in Early Childhood Education with good starting conditions through favorable structural aspects, like the educator-child ratio, in order to guarantee the basis for good pedagogical practices. Even though the educator-child ratio is often used as a structural indicator in ECEC research, evidence on its relationship with the process quality, meaning the pedagogical practices and interactions inside the group, is less than clear. This study contributes to this research by looking at a variety of moderating factors in the association between the educator-child ratio and the process quality. A systematic literature review identified 187 studies, published between the years 2000 and 2021, of which 47 were ultimately eligible for coding. Preliminary evidence of more than half of these studies shows, that there is substantial empirical evidence on this association that goes further than only correlations, but more than half of these analyses could not prove that the ratio is predictive of the process quality. Concerning the role of the moderators, the group composition is only included in a small part of the analyses, while the qualification of the educators is a common moderator. In the majority of the studies, the information on the ratios is collected through questionnaires rather than observations and mostly established global quality scales are used to operationalize the process quality.

E-assessment instrument for assessing children's development and the feedback it offers
Keywords: Assessment Methods, Early Childhood Education, Feedback, Tool Development
Presenting Author: Anne-Mai Meesak, Tallinn University, Institute of Educational Sciences, Estonia

E-assessment has been increasingly used to assess young children's skills. Studies have shown that young children can participate in e-assessments, solving tasks on a tablet with little or no help from teachers. In addition to assessing academic skills, researchers have increasingly noted the importance of social-emotional and self-regulation skills and started using the advantages of e-assessment in their favour. While e-assessment has been used to gather data from children and to identify the areas where children might need help, less attention has been put on the delivery of feedback given to teachers. For the assessment to have value for the teachers, the feedback must be clear and meaningful as well.Estonian Education and Youth Board together with Tallinn University have been developing an e-assessment instrument for assessing five-year-old children's development in five areas: cognitive processes, language, mathematics, learning and social skills. The instrument is standardized, norm-referenced and includes three tests. The tests include specially developed items with child-friendly features such as illustrations, animations, and audio instructions and are entirely computer-assessed. The tests will be free to use for all kindergarten teachers and specialists in Estonia and will include formative written feedback on each child and group of children. The poster will present the principles of the tests, with the emphasis on the written formative feedback provided to teachers. This will be presented together with examples of the items children solved and the constructs assessed.

'A story a day': a study on implicit learning of syntactic structures
Keywords: Curriculum Development, Developmental Processes, Early Childhood Education, Instructional Design
Presenting Author: Athina Ntalli, University of Oxford, United Kingdom; **Co-Author:**Jelena Mirkovic, University of York, United Kingdom; **Co-Author:**Akhila Pydah, Independent researcher, India; **Co-Author:**Adhvika Shetty, Promise Foundation, India; **Co-Author:**Pooja Pandith, Promise Foundation, India; **Co-**

Author: Usha M N, The Promise Foundation, India; **Co-Author:**Sanjana Nagendra, The Promise Foundation, India; **Co-Author:**Kala B., Promise Foundation, India; **Co-Author:**Chandana S., Promise Foundation, India; **Co-Author:**Gideon Arulmani, Promise Foundation, India; **Co-Author:**Sonali Nag, University of Oxford, United Kingdom

We carry out a 10-session oral language intervention with 14 groups of 5- and 6-year-old multilingual children in South India aiming to examine effects of exposure to and practice with specific sentence structures embedded in stories. Focusing on micro-structure elements, specifically the syntactically complex temporal clauses (e.g. '*When Manu heard the thunder, he jumped with joy.*'), we ask whether children being primed with those structures will use them in their story retelling. We further ask which home and school level variables related to language use account for children's performance. Children's narrative expression is tested pre-intervention and thrice more: after the first five intervention sessions, the final five sessions and approximately a month after the intervention. All stories are rich in target subordinate clauses. Additionally, there are questions asked after each story in five of the 10 sessions that aim to elicit the target structures and there is subsequent modelling of the target structure by the teacher. In this poster, we will present the first analyses from this intervention to consider implications for children's implicit learning from the language of storybooks.

Session M 25

25 August 2023 12:00 - 13:30
UOM_R01
Poster Presentation
Higher Education, Instructional Design, Motivational, Social and Affective Processes, Teaching and Teacher Education

E-learning and Online Learning in Studying Metacognition, Emotion and Behaviour

Keywords: Communities of Learners and/or Practice, Cooperative/Collaborative Learning, Curriculum Development, E-learning/ Online Learning, Educational Technologies, Emotion and Affect, Higher Education, Instructional Design, Lifelong Learning, Metacognition, Motivation, Self-regulated Learning and Behaviour, Social Interaction, Teacher Professional Development
Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 08 - Motivation and Emotion, SIG 14 - Learning and Professional Development, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Joni Lämsä, University of Oulu, Finland

Fostering self-regulated learning with metacognitive prompts in an online learning environment
Keywords: E-learning/ Online Learning, Educational Technologies, Metacognition, Self-regulated Learning and Behaviour
Presenting Author: Rebecca Pape, Catholic University of Eichstätt-Ingolstadt, Germany

Students must self-regulate in online learning environments. Many students, especially younger students, however, struggle to do so. Previous research presents evidence that metacognitive prompts are effective to foster self-regulated learning in online learning environments. Therefore, this study, firstly, investigates the students' metacognitive activities in an online learning environment and secondly, aims to examine the students' use of metacognitive prompts as a means to support self-regulated learning. To assess the students' metacognitive activities and their use of the metacognitive prompts, the participants (*N*=34) completed a 30-min learning phase in the online learning environment while thinking aloud. Preliminary results show that planning seems to be a frequent activity in the online environment and that students using metacognitive prompts refer more frequently to the overall learning process than the control group.

Sparking enjoyment in online synchronous education: The function of emotional mimicry
Keywords: E-learning/ Online Learning, Educational Technologies, Emotion and Affect, Social Interaction
Presenting Author: Muhterem Dindar, Tampere University, Finland; **Co-Author:**Anne Christiane Frenzel, Ludwig-Maximilians-Universität München, Germany

Nowadays, it is common for higher education institutions to organize online courses in which teachers and students participate in live lectures through web-conferencing technologies. This is coined as online synchronous education (OSE) in the literature. A growing body of research has explored ways to facilitate high quality interactions between teachers and students in OSE. The current study contributes to such ongoing efforts by focusing on an underexplored phenomenon, emotional mimicry (i.e., direct emotional transmission between the individuals). Specifically, the study aims to investigate the extent of emotional mimicry between teachers and students in OSE, and its impact on lesson enjoyment. For this aim, around 20 higher education teachers and 180 of their students were invited to participate in a naturalistic OSE lecture. Data collection includes video recording of teachers' and students' facial expressions during the live online lecture, and measurement of their self-reported lesson enjoyment. Data collection is in process. Machine learning will be applied on the video recordings to classify the momentary facial emotions of teachers and students under the happy, sad, neutral, surprised, and scared categories. Recurrence quantification analysis will be applied on the classified emotions to detect the extent of emotional mimicry between the teachers and students. Following, correlational analyses will be conducted to investigate whether emotional mimicry relates to the self-reported lesson enjoyment by teachers and students. This study will provide valuable insights regarding the dynamic interactions between the teachers' and students' emotions in OSE.

Self or System – Who regulates? The Effects of Prompts in Adaptive Learning
Keywords: E-learning/ Online Learning, Higher Education, Metacognition, Self-regulated Learning and Behaviour
Presenting Author: Patrick Albus, Ulm University, Germany; **Co-Author:**Aileen Schlichting, Universität Ulm / Institute of Psychology and Education, Germany; **Co-Author:**Tina Seufert, Ulm University, Germany

Adaptive learning (AL) approaches in computer-based systems may be used to provide individualized support to the learner. Systems often perform regulatory tasks for the learner (e.g., planning the next steps). However, whether this is profitable for self-regulated learning (SRL) is ambiguous. Empirical research shows that learners tend to have problems with SRL, so support should start with promoting self-regulation. Metacognitive prompting is a way to improve learners' SRL competencies by suggesting to learners how to proceed with learning in a self-regulated manner. In this way, traceability is increased, and the regulatory tasks that the system performs in the background also become visible. Therefore, we want to investigate the influence of system or self-regulation and the presence or absence of prompts on learning performance and motivation. We predict higher learning performance and motivation in prompt groups and differences between groups receiving system or self-regulation. We assume synergetic effects between the agency of regulation (self or system) and the presence of prompts. Whereas the effect of system or self-regulation on learning performance, depending on the presence of prompts, is moderated by metacognitive strategies. Hence, in our 2x2 design study, we vary the agency of regulation (system or self) and the prompting (with or without prompts). We examine learning performance, motivation, and the actual learning path as dependent variables. Data analyses are conducted through two-factorial ANOVAs. The poster contribution will discuss the results of the research.

Improving students' Life Skills to seed for the future. An Italian Faculty Development program
Keywords: Curriculum Development, E-learning/ Online Learning, Higher Education, Lifelong Learning
Presenting Author: Roberta Silva, University of Verona, Italy; **Co-Author:**Luigina Mortari, University of Verona, Italy; **Co-Author:**Alessia Bevilacqua, University of Verona, Italy

Life Skills, which are the subject of in-depth study in numerous international documents, represent a combination of different capabilities that enable individuals to face everyday life's demands and challenges effectively. Promoting them to younger generations is a priority as they allow them to face the challenges of a present and, above all, of a future characterized by increasing uncertainty and complexity. This paper aims to present the results of evaluation research carried out concerning the second year of the "Transversal Skills" Program realized by the University of Verona (Italy) to promote student development from a personal, professional, and civic point of view. 57.6% of the participants in the second run of the Program participated in the survey, including open and closed questions. Specific attention of the Teaching and Learning Center is given to the answers to the open questions as they allow researchers to approach evaluation research with a transformative perspective. The results of the framework analysis, which is still ongoing, confirm the students' positive evaluation of the initiative and

stress the desire to connect topical issues with the development of life skills. On the other hand, bureaucratic-organizational difficulties seem to emerge concerning managing a very complex Program. Overall, the students' words attest to the effectiveness of the Program, also in light of its theoretical framework. It is considered an opportunity for enrichment because it allows the development of the necessary skills and a greater awareness of the complexities of a world in constant, critical change.

The facilitators and barriers of online-delivered teacher training
Keywords: Communities of Learners and/or Practice, Cooperative/Collaborative Learning, E-learning/ Online Learning, Teacher Professional Development
Presenting Author: Catalina Lomos, LISER - Luxembourg Institute for Socio Economic Research, Luxembourg; **Co-Author:**Hans Luyten, University of Twente, Netherlands; **Co-Author:**Filipe Lima da Cunha, SCRIPT (Service de Coordination de la Recherche et de l'Innovation pédagogiques et technologiques), Luxembourg; **Co-Author:**Frauke Kesting, SCRIPT (Service de Coordination de la Recherche et de l'Innovation pédagogiques et technologiques), Luxembourg

The integration of ICT in classroom practice is a complex process supported and hindered by specific facilitators and barriers. Many authors have identified barriers as institutional and personal, and facilitators as professional development and collaboration around the adoption ICT. For this study, we designed and implemented a professional development training as a professional learning community centered on the integration of a digital learning platform for mathematics in teaching practice in primary schools. Fifty teachers from ten schools in Luxembourg implemented the training for six months, following it online but as a team meeting physically in their school. Using content analysis, we analyzed teachers' perceptions of the barriers and facilitators of this online-delivered training, as reported across the six sessions. Teachers reported barriers related to the format and the delivery in the first sessions of the training. The most relevant facilitator was the collaborative character of the training, the fact that teachers had to attend the training together as a team in their school. This study identifies the barriers and facilitators of a professional development program focused on integrating ICT in teaching practice, the training itself being delivered online. Knowing how teachers perceive an online training and what conditions could improve its outcomes for teacher learning is an important contribution, considering the recent diversification of formats of teacher training.

Anthropomorphism and Emotional Valence in Instructional Images
Keywords: E-learning/ Online Learning, Emotion and Affect, Instructional Design, Motivation
Presenting Author: Sascha Schneider, University of Zurich, Switzerland; **Co-Author:**Nadine Scheller, Technische Universität Chemnitz, Germany; **Co-Author:**Sebastian Jansen, Technische Universität Chemnitz, Germany

When emotional valence is graphically represented (e.g., in anthropomorphized learning material), an attribution of human attributes automatically takes place. Therefore, anthropomorphism and emotional valence should be considered together. Previous studies on anthropomorphization of learning materials show improvement in learning performance while using graphical learning materials or decorative pictures. Moreover, studies on emotional valence of graphical learning materials predominantly show learning-enhancing effects of positive emotions. To our knowledge there is only one study with contradictory findings. Additionally, studies on the interaction between anthropomorphization and valence show better learning outcomes with positive valence and an anthropomorphized learning environment. In this submission, we present a study, focusing on the interaction of the anthropomorphization and emotional valence in instructional images. Therefore, 161 students were randomly assigned to a 2 (anthropomorphization: high vs. low) x 2 (valence: positive vs. negative) factorial between-subjects design with an additional control group. The results confirm the previous findings as the group with the anthropomorphized learning material including positive valence achieved the best results in the learning test. Furthermore, a higher intrinsic motivation leads to better learning outcomes for anthropomorphized learning material especially with a higher degree of anthropomorphization.

Session M 26

25 August 2023 12:00 - 13:30
UOM_A06
Workshop
Higher Education

Analysis of high-arousal teaching episodes through video-recorded data

Keywords: Higher Education, Teaching Approaches, Video-based Learning, Well-being
Interest group: SIG 04 - Higher Education

This workshop focuses on analysing higher education (HE) teaching through various kinds of data (video-recorded segments of teaching, smart ring measurement data). In this collaborative session, participants are provided with an opportunity to analyse synchronized video- and EDA-data as well as to discuss the opportunities and obstacles surrounding this kind of analysis. The collaboration is supported by presenting the participants with some background data and theoretical considerations, but participants are also encouraged to discuss the possibilities of combining various data sources and utilizing such data in examining the relations between teaching processes and wellbeing of HE teachers. In addition, discussion related to ethical perspectives is promoted during the workshop.

Analysis of high-arousal teaching episodes through video-recorded data
Presenting Author: Liisa Postareff, HAMK University of Applied Sciences, Finland; **Co-Author:**Heta Rintala, Häme University of Applied Sciences, Finland; **Co-Author:**Anna Parpala, University of Helsinki, Finland; **Co-Author:**Petri Nokelainen, Tampere University, Finland; **Co-Author:**Milla Räisänen, University of Helsinki, Finland; **Co-Author:**Anna Wallin, University of Tampere, Finland; **Co-Author:**Ilmari Puhakka, Tampere University, Finland

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Session M 27

25 August 2023 12:00 - 13:30
UOM_A05
ICT Demonstration
Learning and Instructional Technology

Wikadoe:a dutch website to monitor and increase the self-regulated learning of primary school pupils

Keywords: Learning Strategies, Lifelong Learning, Primary Education, Self-regulated Learning and Behaviour
Interest group: SIG 16 - Metacognition and Self-Regulated Learning

Please bring your own device if you are attending this ICT demonstration.The overall objective of this research is to monitor and increase the self-regulated learning of school pupils from 10 – 12 years. SRL is a multidimensional concept of which several definitions can be found in the international literature. So an in-depth literature review is very important. We decided to blend the definitions of Zimmerman (2009) and Panadero (2014):
"SRL is an interplay of cognitive, metacognitive, motivational and emotional processes that a learner deploys to achieve learning goals. It's an active process in which learners take control of their own learning."
In the current study, we describe how we've created and validated a measuring instrument to monitor students' self-regulation skills. Our research question is: "How can we map self-regulation of primary school pupils by a dashboard and how can we gain insight into the relationship between the teacher's approach and

students' self-regulation skills?"
The measuring tool is implemented on a website which provides schools an instrument to measure and monitor students' self-regulated learning. The website incorporates a dashboard function for teachers, the results are displayed automatically and shown in graphs at school, class and student-level.

Wikadoe:a dutch website to monitor and increase the self-regulated learning of primary school pupils
Presenting Author: Natalie Boelen, Hogeschool PXL, Belgium; **Presenting Author:**Jolien Quinten, Hogeschool PXL, Belgium

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Lunch / Sponsored Session 1

25 August 2023 13:30 - 14:30
UOM_CR
Sponsored Session

MDPI – Academic Open Access Publishing

Keywords: Communication Skills, Competencies, Researcher Education, Writing/Literacy
Interest group:

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MDPI – Academic Open Access Publishing
Presenting Author: Nemoiu Mihai-Alexandru, MDPI AG, Romania; **Presenting Author:**Aleksandar Antić, MDPI, Switzerland

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Session N 1

25 August 2023 14:45 - 16:15
UOM_CH
Invited Symposium

Avenues to improve students' learning with multiple documents

Keywords: Comprehension of Text and Graphics, Digital Literacy and Learning, E-learning/ Online Learning, Feedback, Higher Education, Metacognition, Reading, Secondary Education
Interest group: SIG 02 - Comprehension of Text and Graphics
Chairperson: Carolin Hahnel, Germany
Chairperson: Cornelia Schoor, Leibniz Institute for Educational Trajectories (LIfBi), Germany
Organiser: Carolin Hahnel, Germany
Organiser: Cornelia Schoor, Leibniz Institute for Educational Trajectories (LIfBi), Germany
Discussant: Ladislao Salmerón, University of Valencia, Spain

Nowadays, learning in academic contexts often requires multiple documents, for example, when teachers assign students more than one text to study on a specific topic or when students use the Internet as a source of information. However, multiple document reading is demanding, as it requires students to build a coherent understanding of their reading of different texts that integrates different perspectives, theories, and ideas about the chosen topic. The contributions of the symposium shed light on cognitive and metacognitive challenges imposed on learners, highlighting avenues for overcoming them. The first talk by Hämäläinen and Kiili spotlights different facets of school students' integration of text and source information, demonstrating their specific problems to meet multiple document requirements. The next two talks broaden the perspective on why problems may arise by drawing attention to metacognitive aspects when working on multiple-document comprehension tasks. Schoor et al. focus on students' task model development (before vs. after the tasks), addressing aspects of plan development, while Tabbers et al. examine the role of monitoring accuracy, shedding light on how accurately students assess their own level of comprehension and whether their performance is related to over- and underestimation. Finally, Hahnel et al. present data on how a little nudge may support students in studying with multiple documents. They report on the effects of both group-based and personalized dashboard feedback in a one-semester Moodle course on students' behavior of integrating information and sourcing.

Students Engaging in Multiple Texts Literacy Task: Investigation of Integration
Presenting Author: Elina Hämäläinen, University of Jyväskylä, Finland; **Co-Author:**Carita Kiili, Tampere University, Finland

When readers integrate information from multiple texts, they select, organize, and connect ideas and sources within and across texts. This study investigated how upper secondary school students (*N*=87) integrated multiple online texts when they engaged in a multiple texts literacy task and whether behavioral

engagement and reading fluency were associated with their performance. Students read and evaluated two more and two less credible texts about vitamin supplements, after which they were tasked to use the online texts to write an article for a student magazine. Students' articles were analyzed to determine whether they included the main claims from the more credible texts and whether the article contained false claims or uncritical use of the less credible texts. In addition, five integration types were identified: intratextual integration, intertextual integration, textual-prior knowledge integration, source-content integration, and source-source integration. The results revealed that only 14% of the students included all three main claims in their articles. Furthermore, 40% of the students presented at least partially false claims, and 28% used less credible texts uncritically. The fourth of the students included neither intratextual nor intertextual integration in their articles. Besides, as much as 45% of the students did not integrate any source information in their articles. Moreover, the students, who were more engaged in the task, used more accurate main claims and integrated information more frequently. Finally, students' reading fluency was positively associated with the inclusion of accurate main claims. In the presentation, instructional implications of the results will be discussed.

Students' task model before and after working on a multiple-document task
Presenting Author: Cornelia Schoor, Leibniz Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:**Jean Francois Rouet, University of Poitiers, Center for Research on Cognition and Learning, France; **Co-Author:**MaryAnne Britt, Northern Illinois University, United States

Students' understanding of task instructions (i.e. their task model) is supposed to be updated continuously during work on the task. Yet, research on change of the task model is scarce. Since a multiple-document comprehension task requires strategies that go beyond single-text reading, the readers' task model of this kind of tasks is especially interesting. Thus, it was the aim of the present study to explore task model development between beginning and end of a multiple-document comprehension task. N=158 students were asked to report their task model before and after working on a multiple-document task. Their answers were coded in the number of single-document, multiple-document, and management strategies that they mentioned to be necessary for the task. After the task, students reported more multiple-document strategies, the same amount of single-document strategies, and less management strategies than before starting the task. This result confirms the assumption of a task model development during work on the task.

Seems like a difficult task! Monitoring accuracy in multiple document comprehension
Presenting Author: Huib Tabbers, Erasmus University Rotterdam, Netherlands; **Co-Author:**Carolin Hahnel, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Daniel Schiffner, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Cornelia Schoor, Leibniz Institute for Educational Trajectories (LIfBi), Germany

How accurately can students in higher education estimate their comprehension of multiple documents? And is their estimate based on the same predictors as with single text comprehension monitoring? University students were given a multiple document comprehension assessment, estimated their performance, and rated their interest, effort and task difficulty. Preliminary results (n=153) show that in line with single text comprehension, monitoring accuracy is not very high, low comprehenders seem to overestimate their performance, and high comprehenders seem to underestimate it. In contrast to single-text comprehension findings however, the estimate was only predicted by performance and perceived task difficulty, and not by interest and effort. So multiple document comprehension monitoring is a metacognitive task that is at least in some aspects different from single text comprehension monitoring, and thus requires more research on which cues students (might) use when estimating their performance.

Does individualized feedback promote favorable behaviors in multiple document reading?
Presenting Author: Carolin Hahnel, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Daniel Bengs, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Daniel Biedermann, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**George-Petru Ciordas-Hertel, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Beate Eichmann, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Ilka Wolter, Leibniz Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:**Cordula Artelt, Leibniz Institute for Educational Trajectories, Germany; **Co-Author:**Frank Goldhammer, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany

We explored the effects of process-based individualized feedback on students' processing of multiple documents when learning in a digital environment. For this purpose, we investigated how 452 teacher students engaged with multiple documents in four learning units of a one-semester Moodle course on the use of digital media in the classroom. For each learning unit, the students could access a feedback dashboard. At the beginning of the course, they were randomly assigned to one of two feedback conditions. Students either received general and peer-based feedback for each learning unit (control group) or individualized feedback based on their behavior in engaging with the provided documents in a learning unit (treatment group). We found that students started the course with little or rare indication of engaging in processes specific to multiple document reading. However, the treatment group showed a statistically significant increase in information integration and sourcing behaviors over time, while the control group showed no change or even a mild decline. We discuss these and other findings in terms of ways to promote students' multiple document literacy in higher education.

Session N 2

25 August 2023 14:45 - 16:15
AUTH_CH
Invited Symposium

Spontaneous mathematical focusing tendencies in early childhood

Keywords: Cognitive Development, Early Childhood Education, Mathematics/Numeracy, Parental Involvement in Learning, Quantitative Methods
Interest group:
Chairperson: Minna Hannula-Sormunen, University of Turku, Finland
Organiser: Jake McMullen, University of Turku, Finland
Discussant: Riikka Mononen, University of Oulu, Finland

Typically, examinations of individual differences in mathematical development have used overtly mathematical tasks. However, recent research using non-explicitly mathematical tasks has revealed crucial individual differences in how children focus on mathematical aspects when not guided to do so. This research has found, for instance, that children's tendency of Spontaneous Focusing On Numerosity (SFON) predicts individual differences in early numeracy and mathematical development throughout primary school. A higher SFON tendency is thought to lead to more self-initiated practice with numerical skills in children's everyday lives, which should support learning mathematics. As a part of this EARLI Centre for Excellence in Research, this symposium includes four empirical studies at the forefront of research on SFON tendency and other spontaneous mathematical focusing tendencies.
The first contribution investigates the relation between young children's SFON tendency and their attention to numerical features during parent-child interactions. Next, the second contribution examines the relation between spontaneous focusing on approximate quantities and arithmetic achievement in young children and adults. The third contribution extends this general line of research to examine the developmental patterns associated with spontaneous attention to number when it is highly salient versus when it is low. These patterns will be examined in relation to their emerging mathematical knowledge and domain-general processes. Finally, the fourth contribution introduces a new spontaneous mathematical focusing tendency by examining spontaneous focusing on numerical order in young children. Overall, this collection of studies furthers evidence that these kinds of spontaneous mathematical focusing tendencies are relevant, multi-faceted aspects of early mathematical development.

Spontaneous focusing on number in parent-child interactions
Presenting Author: Alex Silver, University of Pittsburgh, United States; **Co-Author:**Melissa Libertus, University of Pittsburgh, United States

Parental support of children's early math learning can occur through encouraging conversations about math (e.g., Levine et al., 2010), although little work examines how children shape their own math learning environment. We previously found that children who use more frequent number elicitations (questions and prompts about numerical concepts) to seek out numerical information from their parents during parent-child interactions tend to perform better in math. Here, we

explored predictors of children's use of number elicitations and hypothesized that more frequent number elicitations might reflect increased attention to numerical information. To this end, we assessed children's (N=66; *M* age=4;2 years) spontaneous focusing on number (SFON) tendency, which measures unprompted attention to numerical information in the environment, via imitation tasks where children were instructed to imitate a series of actions performed by the experimenter without specifically mentioning what part of the action to focus on (Hannula & Lehtinen, 2005). We predicted that children with higher SFON tendency would also attend to numerical information during parent-child interactions and seek out additional numerical discussion from their parents by using more frequent number elicitations. We found that children's SFON predicted their use of number elicitations two months later, β=.28, *p*=.004, even when controlling for children's overall elicitations, parents' overall and number-specific elicitations, and children's prior numeracy skills. These findings suggest that children's spontaneous focusing on number when imitating others' actions may also manifest in seeking out additional opportunities to discuss numerical concepts when playing with their parents, which in turn relates to their math abilities.

Spontaneous Focusing on Magnitudes and the development of numerical abilities and arithmetic
Presenting Author: Arnaud Viarouge, Paris Cité University CNRS UMR 8240, France; **Co-Author:**Nydia Vurdah, Paris Cité University, France

When studying the relation between early numerical abilities and arithmetic, several studies have highlighted the importance of children's ability to process numerical information in the face of conflicting non-numerical dimensions of magnitude. While studies investigating the link between spontaneous mathematical focusing tendencies and arithmetic have so far been centred on exact number, spontaneous focusing on approximate quantity and other, non-numerical dimensions of magnitude could shed light on the relation between non-symbolic and arithmetic abilities. We collected data in kindergartners, first graders, and adults, on a spontaneous focusing on magnitudes (SFOM) task, a non-symbolic quantity comparison task, and arithmetic achievement. Our preliminary analyses show relatively stable SFOM tendencies across our three age groups. However, in the younger groups, we observe associations between children's SFOM tendencies for non-numerical dimensions of magnitude and their ability to handle the conflict between these dimensions and number in a quantity comparison task. In kindergartners, while SFOM tendencies were not directly related to arithmetic abilities, we observed a trend towards a significant interaction between performance during quantity comparison and SFOM tendencies in predicting arithmetic abilities, with a stronger relation between non-symbolic and arithmetic abilities for higher levels of SFOM tendencies. These results confirm the role of SFOM tendencies in the development of numerical and arithmetic abilities and suggest that these tendencies reflect individual differences in strategy use when solving arithmetic problems.

Longitudinal assessment of attention to numerosity
Presenting Author: Michele Mazzocco, University of Minnesota, United States; **Co-Author:**Jeffrey Bye, University of Minnesota, United States

Previous studies with the Attention to Number (AtN) task (Chan & Mazzocco, 2017; Mazzocco et al., 2020) revealed contextual effects in children's focus on numerosity compared to other features, with children (and adults) making more numerosity-based matches when competing features had relatively low salience (e.g., pattern, location) compared to high salience (e.g., color, shape). Interestingly, children (and adults) also make more numerosity-based matches overall when trial blocks pitting number against lower salience features appeared first, compared to trials pitting number against higher salience features. However, children made notably fewer numerosity-based matches than adults in these studies regardless of trial order, perhaps due to their developing understanding of number concepts. Although cross-sectional data fail to reveal marked developmental differences in attention to numerosity from ages 5 to 8 years, this question has not been examined longitudinally. Here we report longitudinal results from an ethnically- and socioeconomically-diverse sample of 207 4- to 8-year-old children who completed the attention to numerosity task annually, over two (n = 207) or three years (n = 60). We examined AtN performance over time, and its relation to children's performance on measures of number knowledge. Our goals are to identify (a) whether overall frequency in numerosity-based matches and the contextual influences on such frequency change during the early school age years, (b) whether changes over time are associated with emerging number concepts or mathematics achievement and (c) whether individual differences in executive function skills moderate these relations.

SFON and Spontaneous Focusing On Numerical Order as predictors of early numerical development
Presenting Author: Minna Hannula-Sormunen, University of Turku, Finland; **Co-Author:**Jo Van Hoof, University of Turku, Finland; **Co-Author:**Heidi Harju, University of Turku, Finland; **Co-Author:**Cristina Nanu, University of Turku, Finland; **Co-Author:**Jake McMullen, University of Turku, Finland

Understanding both the cardinal and the ordinal properties of numbers are crucial for children's early and later mathematical development (Fuson, 1988). Moreover, children's tendency to spontaneously focus and use mathematical aspects in their surroundings supports their mathematical development. Especially relevant for cardinality recognition skills of young children is their tendency to spontaneously focus on numerosity (SFON) (Hannula & Lehtinen, 2005). The current longitudinal research aims to investigate whether children have individual differences in SFON and spontaneous focusing on numerical order (SFONO), and how these individual differences are associated with their concurrent and later cardinality and ordinality related numerical skills. The participants of the 6-month follow-up study were 3.5 – 4.5 -year-old children (*N* = 152). In both measurement points children's SFONO was assessed by three novel play situations that offered possibilities to spontaneously (i.e. self-initiated way) recognize and produce a numerical order from sets of items. Apart from SFONO, children's SFON, cardinality recognition, numerical ordering, ordinal number word understanding, and number sequence production were in.
Preliminary results show that children had substantial individual differences in their SFON and SFONO tendencies. Correlations to other numerical skills were stronger for SFONO than for SFON. Developmental relations between SFON, SFONO and other numerical skills will be further analyzed. Overall our findings suggest that SFONO is a relevant, distinguishable component of early numerical development.

Session N 3

25 August 2023 14:45 - 16:15
HELEXPO_CC
Invited Symposium
Assessment and Evaluation, Instructional Design, Learning and Social Interaction, Motivational, Social and Affective Processes

Opportunities & challenges of learning and assessment in democratic citizenship education in schools

Keywords: Assessment Methods, Attitudes and Beliefs, Citizenship Education, Cooperative/Collaborative Learning, In-service Teachers, Large-scale Assessment, Learning Strategies, Qualitative Methods, Quantitative Methods, Secondary Education, Self-efficacy
Interest group: SIG 13 - Moral and Democratic Education
Chairperson: Lihong Huang, Norway
Organiser: Lihong Huang, Norway
Discussant: Jens Bruun, Aarhus University, Denmark

This panel brings together ongoing research focusing on the perspectives of both students and teachers in learning citizenship competencies in school. In many European countries, citizenship education is an integral element in the education systems and students have had high achievement in citizenship knowledge, but this does not necessarily result in their active participation in democracy. However, active participation is essential for the sustainable development of our democratic societies. Previous research evidence has shown that learning and knowing democratic systems and principles constitute only a small part of the citizenship competencies that our future citizens need. Meanwhile, the political efficacy of the student is instrumental for active citizenship, which can only be acquired through active participation. The panel presents four studies bringing results from Belgium (paper 1) and Norway (paper 2 & paper 3), and together with six other European countries (paper 4). Paper 1 presents an analysis of the quantitative data on the comparison of institutional trust between two age groups of younger adolescents and adolescents from Flanders, Belgium. Paper 2 presents a study of developing political efficacy in school social science classrooms in Norway which reveals that the school environment as a democratic arena is important. Paper 3 presents a formative intervention study in a social studies classroom in Norway which suggests that cooperative learning enhances student political efficacy to some extent. Paper 4 presents a study on teachers' perspectives on using formative assessment to promote democratic citizenship competence in eight European countries.

Generational differences in Institutional Trust among Adolescents in Flanders
Presenting Author: Ellen Claes, KU Leuven, Belgium; **Co-Author:**Maria Magdalena Isac, University of Groningen, Netherlands; **Co-Author:**Linde Stals, KU

LEUVEN, Belgium

The paper compares cohort differences in political/institutional trust attitudes among Flemish adolescents by studying the following age groups: young adolescents (14-year-olds, N=2,880) and adolescents (18-year-olds, N=4,380). The study draws on data from two surveys on adolescents' citizenship competencies, which were the Flemish data and the National Assessment on Civic and Citizenship Education (NACCE 2016) in 2016. We find no significant differences between the two age groups. As context matters in trust evaluations (van der Meer & Dekker, 2011), this design kept context (time and country) stable. The main analyses are performed in a structural equations modelling (SEM) framework. The study indicated that political trust in adolescence can be considered more as a personal disposition.

"We just try to learn as much as possible" in Norwegian Social Science Classrooms
Presenting Author: Anders Kjøstvedt, Oslo Metropolitan University, Norway; **Co-Author:**Evy Jøsok, Oslo Metropolitan University, Norway

This paper explores how citizenship education in general and the school subject of Social Science, in particular, may contribute to students' political efficacy. It discusses opportunities for and challenges against the development of political efficacy among the students along two axes: the school environment as a democratic arena and the classroom as an "open classroom climate". The research is based on interviews with 9th Grade students in four Norwegian lower-secondary schools. The study suggests that the school environment seems important for how the students see themselves as democratic participants, especially, since the students are receptive to democratic school processes that lead to concrete results or actions and are meanwhile disillusioned by absent and distant school leadership. The study also finds the obstacles to a well-functioning "open classroom climate" identified by the students.Our research questions: - How do the students conceptualize democratic participation, and in what ways do they see themselves as participants in democracy?- In what ways do the students understand their school as a democratic arena, and what are their experiences of democratic interaction with teachers and school leadership? - What are the students' experiences of their classroom as an "open classroom climate" preparing them for democratic participation through classroom discussions? What do the students think to limit an open exchange of personal opinions as well as professional perspectives?

The effect of cooperative learning on student political efficacy: A formative intervention study
Presenting Author: Eva Kosberg, OsloMet, Norway

This presentation investigates how political efficacy can be supported in schools by exploring the connection between the use of cooperative learning techniques in social studies and students' political efficacy. The exploration was done as a formative intervention research project in the tradition of cultural-historical activity theory. The data underlying the research have been analyzed using the constant-comparative method of analysis and consist of observations of and interviews with 14-year-old Norwegian students. The main implication of the study is that cooperative learning has the possibility to enhance student political efficacy, mainly through providing students with opportunities to practice democratic skills such as discussion, cooperation, and constructive social interaction. However, the students' responses point towards tensions within the student group and between the classroom as a unit of learning and the expectations of the classroom as a unit of evaluation as key contradictions that may hinder the realization of a cooperative learning classroom.

Challenges & possibilities teachers face when assessing to promote democratic citizenship competence
Presenting Author: Nanna Paaske, OsloMet, Norway; **Co-Author:**Siri Mohammad-Roe, Oslo Metropolitan University, Norway; **Co-Author:**Wouter Smets, Karel de Grote University college, Belgium; **Co-Author:**Ama Amitai, Karel de Grote Hogeshoo, Belgium; **Co-Author:**Naomi Alexia Randazzo, Centro Iniziative Ricerche e Programmazione economica, Italy; **Co-Author:**Lihong Huang, Oslo Metropolitan University, Norway

The purpose of this article is to understand what challenges and possibilities teachers face when assessing to promote democratic citizenship competence. As background data, preliminary analysis of the International Civic and Citizenship Education Study (ICCS 2016) indicates that oral examination and written tests are the two most used methods of assessment for CE teachers. Peer assessment, student observations, and project work are the three less-used methods. We draw on data material from focus group interviews with teachers from Italy, Belgium, The Czech Republic, Slovenia, Lithuania, Italy, Norway, and Portugal in spring 2022. We investigate the underlying reasons for teachers' choices of using certain forms of assessment methods while excluding other methods. The teacher's responses uncover a need for teachers to be better equipped with relevant tools and approaches to practice formative assessment to develop students' CE. Assessment to promote student CE seems to be challenged by an understanding of the summative assessment of knowledge as easier to operationalize for the teacher, more motivating for students, and more desired feedback by parents.

Session N 4

25 August 2023 14:45 - 16:15
AUTH_T002
Symposium
Motivational, Social and Affective Processes

Adolescents' motivational profiles in different learning areas. Relations with student outcomes

Keywords: Achievement, Engagement, Learning Strategies, Mathematics/Numeracy, Metacognition, Motivation, Science and STEM, Well-being
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Eve Kikas, Tallinn University, Estonia
Discussant: Anastasia Efklides, Aristotle University of Thessaloniki, Greece

Adaptive learning motivation is especially valuable when learning tasks are difficult and challenging for learners. It is well-known that learning tasks become successively more difficult and several aspects of learning motivation tend to decline over middle school years. Person-oriented analyses that allow finding subgroups of students who may need different learning support due to their different motivational profiles have considerable practical value, yet are still less used than variable-oriented methods. The studies presented in the symposium are carried out in three countries and different, but challenging learning areas – school math (Paper 1; Greece and Paper 2; Finland), language arts (Paper 1, Finland), science (biology and physics; Paper 2; Estonia), and using effective but complex learning strategies (Paper 4; Estonia). All studies focus on students at the end of higher middle school. The studies draw on situational expectancy-value-cost motivational framework and make use of person-oriented latent profile (or latent class) analyses. Moreover, as motivation is not only related to academic success, the presentations examine between-profile differences in a variety of student outcomes including academic achievement (Papers 1-3), persistence (Papers 2-3), knowledge and application of learning strategies (Paper 3) as well as well-being (Paper 4), perceived emotions and metacognition (Paper 1), perceptions of need satisfaction, dissatisfaction, and frustration (Paper 3). All presentations give practical implications.

Adolescents' motivational profiles in Math and relations with metacognition, emotions & achievement
Presenting Author: Dimitrios Moustakas, Aristotle University of Thessaloniki, Greece; **Co-Author:**Eleftheria Gonida, Aristotle University of Thessaloniki, Greece; **Co-Author:**Dimitrios Stamovlasis, Aristotle University of Thessaloniki, Greece

The recent focus of educational policies in STEM subjects has strengthened the scientific interest in motivation, being a key factor of mathematics achievement. In this context, our research follows a person-centered approach to investigate students' motivational profiles in the subject of Mathematics under the SEVT framework, along with their associations with affective and metacognitive variables. The sample of the study consisted of 297 ninth-graders, attending regular public schools in Greece. Students' performance in Mathematics was measured with 7 ad-hoc mathematical tasks, covering a range of the grade's curriculum. Three self-report measures were used to assess: i) students' motivational beliefs (Expectancy-Value-Cost scale), ii) six achievement emotions (Achievement Emotions Questionnaire) and iii) students' metacognitive knowledge and regulation of cognition (jr Metacognitive Awareness Inventory). Participants also reported their feelings of difficulty and certainty for the provided solution while solving the mathematical tasks, so that their metacognitive experiences would be considered as well. Latent class analysis revealed 3 distinct motivational profiles, two with overall increased motivational beliefs and one with lower ones, mostly characterized by a prominent perceived cost of dealing with Mathematics. The three profiles differed significantly in terms of mathematics performance and affective and metacognitive variables as well, with the profiles showing enhanced motivation standing out as more adaptive. Neither gender nor parents'

educational level effect was found. The results are discussed in light of the recent literature in the fields of student motivation and affect, and educational implications are considered.

Expectancy-value-cost profiles in math and language arts, behavioral engagement, and achievement
Presenting Author: Kukka-Maaria Polso, University of Helsinki, Finland; **Co-Author:**Heta Tuominen, University of Eastern Finland, Finland; **Co-Author:**Petri Ihantola, University of Helsinki, Finland; **Co-Author:**Markku Niemivirta, University of Eastern Finland, Finland

Behavioral engagement - task-related actions - can be seen as something that transmits internal perceptions into educational outcomes. While empirical findings show the benefits of motivation and behavioral engagement for learning and achievement, surprisingly few studies have focused on their mutual connections considering the subject-specificity of motivation and using several indicators of behavior. Thus, the present study investigated a) what kinds of cross-domain expectancy-value-cost profiles in math and language arts can be identified among lower secondary school students, and b) how the profiles are associated with behavioral engagement and academic achievement. A nationally representative sample of Finnish 7th-, 8th-, and 9th-graders (N = 7745) were classified into groups according to their subject-specific self-concepts, task values, and perceived costs using latent profile analysis. Next, profile differences in achievement (grades, test scores) and both self-reported and non-self-reported behavioral engagement (e.g., persistence, time-on-task) were investigated. A five-profile solution described the data best. More than half of the students reported intermediate or high motivation towards both subjects, whereas a fifth had an overall low motivation. The rest showed differentiated patterns with high motivation in one and low for the other subject. As in prior studies, boys were overrepresented and girls underrepresented in the predominantly math-motivated group. Motivational profiles were meaningfully related to behavioral engagement with the more positive groups appearing most engaged. Profile differences were more pronounced in math than language arts achievement. Further research is needed on how various indicators of engaged behavior relate to motivation in different contexts and time spans.

Motivational profiles in biology and physics, relations with learning and need satisfaction
Presenting Author: Kati Aus, Institute of Educational Sciences, Estonia; **Co-Author:**Ita Puusepp, University of Helsinki, Finland; **Co-Author:**Eve Kikas, Tallinn University, Estonia

Due to the mismatch between the low popularity of STEM subjects among students and the high need for skilled professionals in the society, many studies have examined students' STEM-related motivation. This study contributes to the field by using person-oriented analysis to examine motivational profiles in biology and physics. The first aim was to identify groups of students with different expectancy, value (intrinsic, utility), and cost profiles in biology and physics. Our second aim was to examine group differences in various student outcomes: academic learning behavior (persistence), knowledge of and application of effective learning strategies, grades, as well as students' perceptions of their psychological needs satisfaction, dissatisfaction, and frustration by their biology and physics teachers. The participants (1504 eight and ninth grade students) completed web-based questionnaires and reported their grades. We identified four general profiles with *Indifferent*, *Low*, *Average*, and *High* motivation, as well as two subject-specific profiles with *High biology/Low physics* and *High physics/Low biology* motivation. ANOVAs showed between-group differences in all studied variables. Regarding the two subject-specific profiles, groups differed in their grades in physics (but not in biology and math) and task-persistence, but not in knowledge and application of effective learning strategies. These subject-specific profiles also differed in students' perceptions of their need satisfaction in respective subject classes, while generally students with more adaptive motivational profiles experienced more need satisfaction from their teachers. *High biology / Low physics* motivation group included more girls and *High physics / Low biology* group more boys. Theoretical and practical conclusions are discussed.

Profiles of learning motivation and strategies related to grades and psychological well-being
Presenting Author: Eliis Härma, Tallinn University, Estonia; **Co-Author:**Aleksander Pulver, Tallinn University, Estonia; **Co-Author:**Eve Kikas, Tallinn University, Estonia

This study applied a person-oriented approach to differentiate middle school students' academic achievement and psychological well-being among subgroups by employing latent profile analysis. The subgroups were identified according to their learning-related motivational beliefs (indicating how motivated they are to learn effectively based on expectancy-value-cost theory) and the perceived effectiveness of learning strategies (about how students evaluate deep and surface learning strategies). Further, we explored how these profiles relate to academic achievement and psychological well-being. Participants (N = 1356; 50.2% boys, Grade 8) completed three questionnaires assessing the perceived effectiveness of learning strategies, learning-related motivational beliefs, and psychological well-being. Math, Science, and Estonian language Grade Point Averages (GPA) from Grade 7 and reading comprehension scores were used as academic achievement measures. Combining students' motivational components and perceived effectiveness of learning strategies, four profiles were identified. The results showed significant between-profile differences in academic achievement and psychological well-being indicators. Results, as well as their implications, are discussed.

Session N 5

25 August 2023 14:45 - 16:15
UOM_CR
Symposium
Motivational, Social and Affective Processes

Measuring emotions in education – possibilities and limits of new approaches

Keywords: Cooperative/Collaborative Learning, Developmental Processes, Emotion and Affect, In-service Teachers, Interest, Motivation, Primary Education, Quantitative Methods, Secondary Education, Teacher Efficacy, Well-being
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Matthias Huber, Austria
Organiser: Kerstin Helker, Eindhoven University of Technology, Netherlands
Discussant: Julia Morinaj, University of Bern, Switzerland

Emotions are crucial for students' motivation, learning, achievement, and overall well-being; moreover, emotions are also essential for teachers' motivation, professional performance, job satisfaction, and health. Therefore, theoretical grounded measurement instruments are needed, that allow both, the analyzation of the function and origin of emotions as well as the possibility to access these emotions in educational practice (Pekrun et. al 2011, p. 36). In the last decade many questionnaires and scales were developed (or adapted), to fulfill this research demand (Niedenthal & Ric 2017, p. 35f.). Nevertheless, there is still a lack of valid instruments especially for specific settings or particular target groups; but the conception of new instruments for the measurement of emotion in education comes along with several methodological difficulties: e.g. Do the participants understand items about emotions in the same way as the researchers? (How) is it possible to consider culture, language or the socio-economic background? And is it generally conceivable to quantify emotional qualities?etc.To discuss these questions critically, four approaches will highlight their novel and innovative instruments, starting with a new beliefs about emotion scale for primary school students in Italy (n=1420), followed by a new questionnaire for the feeling of security and comfort for primary and secondary school students in Austria (n=1462). In the third presentation from Germany a new measure for the educational context to investigate dealing with emotions in (professional) teams will be presented (n=706), whereas the last study focusses on a new adaption of a questionnaire for teachers' intrinsic motivation in China (n=179/2982).

The robust implicit beliefs about emotions scale (R-IBES) for primary school students
Presenting Author: Daniela Raccanello, University of Verona, Italy; **Presenting Author:**Giada Vicentini, University of Verona, Italy; **Co-Author:**Angelica Moè, University of Padova, Italy; **Co-Author:**Stephanie Lichtenfeld, Universität Hamburg, Germany; **Co-Author:**Roberto Burro, University of Verona, Italy

Beliefs on malleability are related to a wide range of emotional, motivational, and cognitive constructs. Endorsing an incremental mindset has been revealed beneficial and it is associated with a better adaptation to external challenges, also in the learning contexts. Concerning beliefs about emotions, empirical research has predominantly focused on adults. Less is known about mindsets of emotions in children, partly because instruments measuring them are largely lacking. The present study evaluated beliefs about malleability of emotions in primary school students, by adapting and validating the child version of the Robust

Implicit Beliefs about Emotions Scale (R-IBES). We involved a sample of 1,420 second and fourth-graders. We applied a combined approach using exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and Rasch modelling. EFA and CFA supported the bidimensional structure of the scale, distinguishing beliefs for positive and negative emotions. A measurement invariance analysis indicated that the scale was invariant across class level and gender. The Rasch model permitted to transform the scale into an instrument respecting the properties of fundamental measurement. In consecutive analyses discriminant and predictive validity of the scale were determined by investigating the relation of beliefs about malleability with emotion regulation and well-being. Moreover, a linear mixed model revealed that beliefs about malleability were higher for positive compared to negative emotions. Limitations and suggestions for future research, together with implications for utilizing the R-IBES scale to inform interventions to foster an incremental mindset, are discussed.

The sense of security and comfort in the classroom – validation of a new questionnaire
Presenting Author: Matthias Huber, University College for Teacher Education Carinthia, Austria; **Presenting Author:**Markus Herrmann, University College of Teacher Education Carinthia, Austria

The sense of security and comfort is a basic need consisting of the experience of emotional warmth, trust, and safety. In education, a sense of security and comfort increases the students' overall well-being, self-confidence, curiosity, and willingness to learn, underlining the importance of this topic from a student's perspective. Current social and political conditions, like the pandemic or the war in Europe, emphasize the relevance of this emotion in general. However, there are hardly any studies in the context of teaching and learning, that investigate this complex, self-conscious emotion. Therefore, the present study aims to explore the possibilities of measuring the sense of security and comfort in schools. Based on theoretical models, a questionnaire for primary and lower secondary school was developed. The item construction went through different stages of qualitative and quantitative pre-tests. The main survey (consisting of eight scales) aims to explore the content and construct validity, the model fit, and the mediation effect by exploratory factor analysis, measurement models and structural equation modelling. The sample of the present study includes 1462 pupils from 17 schools and 87 classes. The first results show the primary four-factor inventory is consistent with the theoretical framework and shows great validities. Therefore, further single-item analyses will be discussed by methods of measurement models and structural equation modelling. By means of cluster analysis, four clusters — the sheltered pupils, teachers' darlings, peers' favourites, insecure pupils — were found and allow the plausibility verification and description of the sample.

The development of a measure to investigate dealing with emotions in teams
Presenting Author: Sebastian Gerbeth, University Regensburg, Germany; **Co-Author:**Elena Stamouli, University of Regensburg, Faculty of Human Sciences, Germany; **Co-Author:**Regina Mulder, University of Regensburg, Germany

Teamwork shapes learning and work processes and are of great importance in all kinds of organisations, including education. Emotions are prerequisites, companions and results of learning and work processes and are therefore also emergent in teams (e.g. team-teaching, special interest groups, preservice teachers etc.). When seeking to understand the role of emotions in teams, previous research addressed that emotions in teams and the dealing with emotions in teams are complex and multilevel phenomena. While there are measurement instruments on emotional competence at the individual level, suitable measurement instruments at team level are lacking. This is mainly because at team-level emotions and the dealing with emotions are addressed based on the multi-level theory with the help of compilation models (team level is a complex combination of diverse individual level contributions) and, therefore, often are examined by aggregating individual level data. Recent research shows that on the other hand composition models of emotional constructs (team level is the coalescence of identical lower-level properties) can also explain variance in outcomes such as performance, beyond the individual level. In this contribution we develop a measure by describing the design, the requirements for a good measure and the different steps that were taken, considering the team level on the basis of multilevel theory, that can be used for investigating the dealing with emotions in teams.

Teachers' intrinsic orientation for the profession: Scale development and validation
Presenting Author: Xiangyuan Feng, University of Groningen, Netherlands; **Co-Author:**Michelle Helms-Lorenz, University of Groningen, Netherlands; **Co-Author:**Ridwan Maulana, GION - University of Groningen, Netherlands

Teachers' intrinsic orientation for the profession (TIOP) refers to the degree to which teachers experience positive emotions and high meaningfulness in their profession. Compared to other teacher psychological factors, the knowledge about TIOP is underrepresented in the literature. To date, only three empirical studies have been conducted to construct its operational framework and explore its characteristics in the Dutch context. Considering the theoretical significance and methodological limitations of these studies, the present study aims to enrich the knowledge base of TIOP and refine its measurement by investigating its relevance in the Chinese context. A mixed method was employed, following the procedures of domain and item generation, theoretical analysis, and psychometric analysis, to develop an enriched TIOP scale. 179 secondary school teachers and 2982 students participated in the study. Results suggest the enriched scale can validly and invariantly measure TIOP across gender, age, and subject groups in the Chinese context. It consists of five dimensions: positive emotions for teaching activities and the subject, intrinsic value for self and others, and future-time goals. Research results suggest that TIOP is strongly correlated with teacher well-being and student-perceived teaching quality. The present study adds to the knowledge base of teacher emotion and motivation.

Session N 6

25 August 2023 14:45 - 16:15
UOM_A02
Symposium
Teaching and Teacher Education

Tackling polarization in education: teacher practices, interventions and paradigms

Keywords: Argumentation, Citizenship Education, Critical Thinking, Dialogic Pedagogy, Game-based Learning, Reasoning, Teaching Approaches
Interest group: SIG 13 - Moral and Democratic Education
Chairperson: Geerte Savenije, University of Amsterdam, Netherlands
Chairperson: Bjorn Wansink, Utrecht University, Netherlands
Organiser: Lee Jerome, Middlesex University, United Kingdom
Discussant: Geerte Savenije, University of Amsterdam, Netherlands

Responding to polarization in educational settings is an important aspect of cultivating inclusive education for the 21st century. This session brings together research that analyses situations of conflict and controversy in educational contexts in three countries (the US, Northern Ireland and the Netherlands). It asks how we can take more advantage of friction between perspectives in educational contexts. The first paper focuses on how teachers in Northern Ireland are prepared to teach controversial history, while grappling with the tension between avoidance and risk-taking in their school placements. The second paper focuses on what type of questions Dutch teachers ask during 'hot' discussions. The third papers explores how an online political simulation game in the VS engages students in developing epistemic cognition for informed citizenship. The last paper takes a meta perspective from a review study that asks the question; 'what effective interventions counter polarization in educational settings?' During the plenary discussion we will explore how the teacher practices (i.e., study 1 and 2) and the online game (study 3) are related with the theoretical paradigms that are found in the review study (study 4). In line with the EARLI theme of 2023 this discussion will focus on how educational interventions countering polarization and conflict "can bring hope in uncertain times." In an era marked by the impact of fake news, mainstreaming of far-right ideas, and increasing impact of extremism, addressing the challenges posed by polarization in educational settings and how these can work for positive societal transformations gains new urgency.

From "Flat" to "Deep" Multiperspectivity: Discussing Controversial Issues in Classrooms
Presenting Author: Bjorn Wansink, Utrecht University, Netherlands; **Co-Author:**Sanne Akkerman, Utrecht University, Netherlands; **Co-Author:**Saro Lozano Parra, Utrecht University, Netherlands

Discussing controversial topics in the classroom is known to be challenging for teachers, although such topics also represent valuable opportunities for teaching

students about multiperspectivity and how to engage in constructive discussions in an increasingly polarized society. A framework of multiperspectivity is presented and used to identify how ten Dutch teachers ask students to (a) explore different positions (i.e., making, taking or contrasting perspectives), (b) make various types of claims (i.e., knowledge, value or reality statements) and, potentially, (c) explain and reflect upon the underlying logics (i.e., epistemological, axiological or ontological) of statements. The lessons were observed and video-recorded and the teachers were interviewed immediately afterwards. The findings show that teachers focus mostly on explicating students different opinions and paid much less attention to explicating the different logics of their claims. We have conceptualized this distinction as a focus on flat-multiperspectivity versus deep-multiperspectivity. Our findings indicate how lessons often miss the potential residing in discussions of controversial issues.

Avoidance and risk-taking in teaching controversial history: Competing voices
Presenting Author: Judith Pace, University of San Francisco, United States

How do student teachers in Northern Ireland, prepared to teach controversial history, grapple with the tension between avoidance and risk-taking in their school placements? How is this tension embodied in their emerging teacher identities? This paper analyzes interview data from a larger study on preparation of preservice teachers for teaching controversial issues in history, social studies, and citizenship. It uses Dialogical Self Theory (DST) to examine competing voices as pedagogical lessons from university coursework bump up against culturally ingrained and institutional positions. The paper aims to deepen understanding of the voices that animate young teachers' avoidance or risk-taking when teaching controversial history and the dilemmas produced by dialogue among these voices. Identifying these voices provides levers for teacher educators to foster conscious and productive grappling with dilemmas experienced by teachers, particularly in divided societies. In doing so, both teacher educators and student teachers can lean into a hopeful stance toward education as a powerful vehicle for dialogue, mutual understanding, and critical thought in these uncertain times.

The Impact of a Political Simulation Game on Informed Citizenship (and Against Polarization)
Presenting Author: Jeremy Stoddard, University of Wisconsin - Madison, United States

This paper explores how a political simulation, an online game with the name Persuade, engages students in developing epistemic cognition for informed citizenship. The framework of informed citizenship aligns with the ability to resist the effects of partisanship and polarizing messages. Persuade is based on epistemic games and communities of practice as models for learning and places students in the role of interns at a political communications firm. Tasks in the simulation engage participants in using real data and information sources to design a media campaign on a U.S. state policy issue. Throughout the simulation students are asked to analyze, reason with, and communicate using evidence with a particular focus on the relationship between evidence, context and audience.
Engaging in local and state policy issues using local information and data sources, as well as the focus on multiple perspectives, are also shown to support the likelihood of a decrease in the impact of partisanship and polarization. Persuade also focuses on the nature of the political information environment and asks participants to consider their role within it. This paper examines the experiences of two Wisconsin? explain classes, part of a larger pilot study, to explore how the design engages students in developing as informed citizenship and its likely impact on partisanship and polarization.

Education for peace and hope: review of interventions to counter polarization
Presenting Author: Semiha Sözeri, Utrecht University, Netherlands; **Co-Author:**Maria De Haan, Utrecht University, Netherlands

In response to societal polarization in many Western countries schools have developed transformative pedagogies based on hope and empathy, next to pedagogies that teach students to deal with 'difference', learning to negotiate disagreement. This study systematizes and analyzes recent research asking what effective interventions in educational settings exist that deal with what is considered 'undesirable' polarization. A systematic literature search was conducted in Web of Science that was restricted to original and peer-reviewed research in English, published from January 2014 onwards. Our analysis focuses on 1) the paradigms that underlie interventions addressing polarization, contrasting, for instance, interventions focused on remediation and reconciliation with those that focus on peacebuilding, an ethos of hope and transformative action, 2) the role of context, nature and severity of the group conflict and how intervention approaches and their underlying paradigms can be linked to the particularity of the conflict or tension, and 3) how the answers to these questions translate into suggestions for practitioners working with diverse student populations, and provide them with suggestions for achieving more inclusive, socially cohesive and democratic classrooms. Our findings indicate that underlying paradigms for intervening, as well as their effectivity, are related to the nature of the conflict at hand. This study has the potential to guide the design of effective interventions in polarized educational settings. Its focus on transferability to other contexts and populations, attention to understanding effects within the historical, social, geographical, interethnic, socio-economic setting enhances its potential value across national and local contexts.

Session N 7

25 August 2023 14:45 - 16:15
AUTH_DC2
Symposium

Identifying digital reading strategies in order to facilitate digital reading

Keywords: Cognitive Skills and Processes, Comprehension of Text and Graphics, Digital Literacy and Learning, Eye Tracking, Learning Strategies, Multimedia Learning, Reading, Social Media
Interest group: SIG 27 - Online Measures of Learning Processes
Chairperson: Aurora Troncoso-Ruiz, Behavioural Science Institute, Radboud University Nijmegen, Netherlands
Discussant: Carita Kiili, Finland

Although digital reading has become the norm, digital texts are still often more challenging for readers than print texts (Delgado et al., 2018; Singer & Alexander, 2016). Text complexity could explain this difference: digital texts provide the reader with a non-linear structure, offering numerous paths to access information (Salmerón et al., 2018; Wiley et al., 2018). In order to understand digital reading, it is crucial that we identify how different reading strategies contribute to text comprehension in digital contexts. This symposium, involving participants from four different countries, includes four studies identifying reading strategies in digital contexts and factors that facilitate or hinder digital reading. First, Lisa Ziernwald (Technische Universität München, Germany) will present a research synthesis on the operationalization of reading strategies and their effects on reading comprehension. Carolien Knoop-van Campen (Radboud University Nijmegen, Netherlands) will present work combining eye-tracking and log-files to investigate whether audio-support can lead to more efficient reading strategies and improve reading comprehension. The other two contributions focus on factors hindering digital reading. Bertram Opitz (University of Surrey, England) will present results showing how the hypertext structure and the presence of hyperlinks can trigger mind-wandering and hinder reading comprehension. Aurora Troncoso-Ruiz (Radboud University Nijmegen, Netherlands) will present how digital media exposure and attention can predict reading strategies when readers deal with contradictory information varying in reliability. The conclusions from this symposium are relevant for our understanding of how digitalization impacts society. Moreover, these results are crucial for the development of educational materials to improve digital reading.

Operationalization and Effectiveness of Reading Strategies in Digital Reading – A research synthesis
Presenting Author: Lisa Ziernwald, Technical University of Munich, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Carolin Hahnel, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Frank Reinhold, University of Education Freiburg, Germany; **Co-Author:**Doris Holzberger, Technical University of Munich (TUM) & ZIB (Centre for International Student Assessment), Germany

Although digital reading has become an essential skill in the last years, research syntheses repeatedly found a disadvantage of digital compared to paper-based reading regarding students' reading comprehension. As digital reading is an indispensable part of future education, getting more profound insights into how certain reading behaviors (i.e., reading strategies) can improve students' reading comprehension in digital reading environments is highly important. Therefore, the present research synthesis investigates (a) how reading strategies are operationalized in digital reading environments and (b) the effect of reading strategies

in digital reading environments on students' reading comprehension (i.e., K-12 students and university students). Overall, *N* = 436 studies were found through an initial literature search. After the first screening, *N* = 103 studies were included for the fine coding, which will be conducted shortly. Results will provide a detailed description of the various reading strategies investigated in a digital reading environment. Furthermore, results will give insights into whether and which reading strategies benefit students' reading comprehension in digital environments.

The impact of audio support on reading strategies in students with dyslexia
Presenting Author: Eliane Segers, Radboud University, Netherlands; **Co-Author:**Carolien A. N. Knoop-van Campen, Radboud University Nijmegen, Netherlands

The use of adequate reading comprehension strategies is important to read efficiently. Students with dyslexia not only read slower and less accurately, they also use fewer reading comprehension strategies. To compensate for their decoding problems, they often receive audio-support (narration written text). However, audio-support linearly guides readers from beginning to end through texts, possibly hindering the use of reading comprehension strategies in expository texts and negatively impacting reading time and reading comprehension performance. We examined to what extent audio-support affects reading comprehension strategies, reading times, and reading comprehension performance in 21 secondary school students with dyslexia and 22 typically developing controls. Participants were provided with three types of assignments (summarizing, open-ended questions, statement questions) in each condition (written text with and without audio-support). SMI RED500 eye-tracker captured eye movements during reading. Readers' attention allocation within the text was indicative for their reading strategy. Following a discrimination based on experts' reading behavior and hand-coded validation, these scores visualized whether students used the intensive reading strategy (reading whole text) or selective reading strategy (focusing on part of the text). In open-ended assignments, students divided their attention more over the whole text instead of focusing on one specific part when audio was added. In addition, audio-support increased reading time in students with and without dyslexia in most tasks, while in neither of the task's audio-support affected reading comprehension performance. Audio-support impacts reading comprehension strategy and reading time in all students.

Hyperlink structures is crucial for attention and comprehension during hypertext reading
Presenting Author: Bertram Opitz, Brandenburg Medical School, Germany

Online reading is becoming more and more popular in learning and teaching environments. However, attention failures also referred to as mind wandering (MW) seem to be more common when reading online compared to an offline reading situation. In this talk I will discuss some characteristics of hypertexts that potentially influence MW and reading comprehension. I will report results of recent studies exploring characteristics like text difficulty based on text cohesiveness but will focus on hyperlink structure. Typically, hyperlinks enable different types of hypertext organization, such as hierarchically organized and networked hypertexts. While hierarchical hyperlinks support the organisation of hypertexts by structuring these texts in semantically related units, networked hyperlinks connect units that have a content overlap to each other without an overall hierarchical structure being apparent. Crucially the latter hyperlink structure seem to induce more task-unrelated thoughts (TUTs) suggestive of MW and lead to poorer reading comprehension, suggesting that hyperlinks can be considered new cohesive devices when creating educational online texts. In addition, these findings are modulated by the difficulty of the hypertext but also by the working memory capacity (WMC) of the reader. These results will be discussed in light of a recent model, suggesting that MW occurs if available cognitive resources do not match with task demands.

Explaining individual differences in digital reading: digital media, attention and print exposure
Presenting Author: Aurora Troncoso-Ruiz, Behavioural Science Institute, Radboud University Nijmegen, Netherlands; **Co-Author:**Naomi van Bergen, Behavioural Science Institute, Radboud University Nijmegen, Netherlands; **Co-Author:**Anouk Bakker, Behavioural Science Institute, Radboud University Nijmegen, Netherlands; **Co-Author:**Liesbeth Craje, Behavioural Science Institute, Radboud University Nijmegen, Netherlands; **Co-Author:**Marco Van de Ven, Behavioural Science Institute, Radboud University Nijmegen, Netherlands; **Co-Author:**Eliane Segers, Behavioural Science Institute, Radboud University Nijmegen, Netherlands

The current study analyzes individual differences in how readers deal with multiple digital texts varying in reliability and position defended. In particular, we investigate whether differences in *digital media exposure*, *attention*, and *print exposure* predict reading strategies and reading comprehension of multiple digital texts. In an experiment, 134 participants read four texts about the consumption of milk, differing in stance (whether the text was for or against the consumption of milk) and reliability (whether the source of information was a reliable or unreliable logo). Participants' reading behavior was tracked using log-files, and their comprehension of the texts was evaluated with questions. Results show that the class of digital media user (learner, gamer or social media user) predicted the reading behavior. Learners and gamers, but not social media users, visited reliable sources more often than unreliable sources. In addition, learners and social media users spent more time on texts against the use of milk. Moreover, attention capacity predicted reading behavior and the reading comprehension, but the latter effect disappeared when controlling for the reading behavior. Finally, participants with higher print exposure had higher comprehension scores, regardless of the reading behavior or the characteristics of the texts (reliability or stance). In conclusion, this study shows that digital reading can be dependent on the print exposure and that high levels of digital media use could hinder the ability to select reliable sources.

Session N 8

25 August 2023 14:45 - 16:15
UOM_A03
Symposium
Learning and Instructional Technology

Can Educational Apps Support Early Learning? Current Evidence on App Design and Evaluation

Keywords: Early Childhood Education, Educational Technologies, Game-based Learning, Mathematics/Numeracy, Writing/Literacy
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Jo Van Herwegen, United Kingdom
Discussant: Laura Outhwaite, University College London, IOE, United Kingdom

Over 55% of children around the world do not have the minimum proficiency levels in foundational maths and literacy skills (UNESCO, 2017). Educational applications (apps) have been identified as a potential solution for raising attainment because of their potential to offer personalised learning opportunities (Sabatini et al., 2022). However, with a vast range of educational apps available to parents, teachers, and policy makers, it remains a significant challenge to determine whether or what kinds of apps will provide a high-quality learning experience. While some specific educational apps have been evaluated with young children (Griffith et al., 2020; Outhwaite et al., 2022), more research is needed to examine how app design features, learning content, and dosage (i.e., time on task) may influence children's outcomes. In response, this symposium brings together current international evidence on the design and evaluation of educational apps for young children in maths, reading, and spelling. Specifically, this symposium will present converging evidence on the importance of in-app feedback, varied content curriculums, and optimal dosage for learning from varied methods, including meta-analyses, content analyses, qualitative comparative analyses, randomised control trials, and analyses of large-scale educational app data. The presenters and discussant will highlight how the current evidence contributes to our understandings of app-based learning and how this can inform evidence-based recommendations for parents, teachers, and other stakeholders. Priorities and directions for future research will also be discussed. This symposium is a collaboration between four early career researchers and PhD students from three countries (Belgium, France, UK).

Understanding How Educational Maths Apps Can Enhance Learning: A Content Analysis and QCA
Presenting Author: Laura Outhwaite, University College London, IOE, United Kingdom; **Co-Author:**Erin Early, QUB, United Kingdom; **Co-Author:**Christothea Herodotou, Open University, United Kingdom; **Co-Author:**Jo Van Herwegen, UCL Institute of Education, United Kingdom

Educational applications (apps) are ubiquitous within children's learning environments and emerging evidence has demonstrated their efficacy. However, it remains unclear what the active ingredients (i.e., mechanisms), or combination of ingredients, of successful maths apps are. The current study developed a

new, open-access, three-step framework for assessing the educational value of maths apps, comprised of: type of app, mathematical content, and app design features. When applied to the maths apps previously evaluated with children in the first three years of school (n=23), results showed that practice-based apps were the most common app type tested (n=15). Basic number skills, such as number representation and relationships, were the most common area of mathematics targeted by apps (n=21). A follow-up Qualitative Comparative Analysis showed observed learning outcomes with maths apps were enhanced when apps combined the following: a scaffolded and personalised learning journey (Programmatic levelling) and explanations of why answers were right or wrong (Explanatory feedback), as well as praise, such as “Great job!” (Motivational feedback). This novel evidence stresses the significance of feedback and levelling design features that teaching practitioners and other stakeholders should consider when deciding which apps to use with young children. Directions for future research are discussed.

Evaluation of Digital Interventions Fostering Early Reading Skills: A Meta-Analysis
Presenting Author: Fien Depaepe, KU Leuven, Belgium; **Co-Author:**Stefanie Vanbecelaere, KU Leuven, Belgium; **Co-Author:**Sameh Said-Metwaly, KU LEUVEN, Belgium; **Co-Author:**Wim Van den Noortgate, KU LEUVEN, Belgium; **Co-Author:**Bert Reynvoet, KU LEUVEN, Belgium

The development of reading skills is an important goal of primary education. Given the importance of reading for later academic performance, teachers aim to offer varied and intensive practice of (early) reading skills to all primary school children (Melby-Lervåg et al., 2012). To this end, digital technologies are increasingly being used in educational settings because they can provide affordances such as interactivity, game features, immediate feedback, and adaptivity. To justify their use, it is important to investigate the effectiveness of digital technologies. So far, meta-analyses have mainly focused on the effectiveness of digital interventions for cognitive outcomes (Cheung & Slavin, 2012; Van Daal et al., 2019). This study takes a broader perspective by examining the effectiveness of digital interventions to promote early reading in terms of near and far transfer cognitive and noncognitive outcomes. Study and intervention characteristics were also examined as potential moderator variables. In total, 72 studies, including 60,890 participants, were analyzed, yielding a mean Hedges’ g effect size of 0.37, which indicates that digital technologies are slightly more effective than traditional teaching methods. Moderator analyses suggest that this effect is consistent across cognitive and noncognitive outcomes but different by sample age, study quality, and the nature of the intervention (targeted versus multicomponent). The results of this study have implications for the design and evaluation of future interventions investigating the effectiveness of digital technologies for reading education.

Understanding Early Mathematical Development using Large Scale Educational App Data
Presenting Author: Zahra Siddiqui, UCL, United Kingdom; **Co-Author:**Laura Outhwaite, University College London, IOE, United Kingdom; **Co-Author:**Jo Van Herwegen, UCL Institute of Education, United Kingdom

Training of symbolic and non-symbolic comparison skills contributes to mathematical development (Van Herwegen et al., 2018). However, dosages used across intervention studies targeting these skills is varied and often inconsistent and infrequently reported (Dietrich et al., 2015). The vast quantities of data that are passively collected from educational maths apps used by young children can provide insights into the optimal dosage for different age groups for these domain-specific skills. The present study used existing data from the maths app developed by Funexpected. Data from children aged 3-7-years-old was analysed using Generalised Additive Modeling (GAMs) to understand the rate of development for symbolic (n = 557) and non-symbolic comparison skills (n= 1,791). Children’s improvement in each domain was indicated as number of trials to achieve zero errors. Results showed younger children required more trials to achieve zero errors, compared to their older peers across both symbolic and non-symbolic skills. A subset analysis of children who had played both games (n = 214) showed that the number of trials needed to achieve zero errors in each domain-specific skill decreased, relative to the number of trials needed when only one of the games was played. This is consistent with a mutualistic theoretical perspective of mathematical development (De Smedt, 2022). Overall, this study has important implications for the design of educational maths apps. It highlights the importance of differentiating dosage of app-based learning, depending on the age of the child, and the inclusion of complimentary mathematical skills, which could be implemented via programmatic levelling.

Evaluating the Effectiveness and Design of an Educational Spelling Application for First Graders
Presenting Author: Cynthia Boggio, Grenoble Alpes University, France; **Co-Author:**Ahmed Zaher, Université Grenoble Alpes, France; **Co-Author:**Marie-Line Bosse, Université Grenoble Alpes, France

While digital tablets are gaining popularity in classrooms, there is little evidence of the specific effectiveness of educational apps compared to the same activity without a tablet. Moreover, educational applications are often gamified, yet the effects of gamification are mixed and rarely tested with children. In response, we tested the efficiency of ECRIMO (first version of an application for spelling training) with 311 first graders (6-7 years). A randomised control trial (RCT) design was implemented with four training groups: no training, paper training, the ECRIMO app with gamification features, and the ECRIMO app without gamification. Spelling, reading and phonological awareness abilities was measured at pre-test and post-test. The training was conducted over a 7-week period (4.40 hours in total). The experimental RCT design allowed us to answer three questions: 1) Is spelling training effective regardless of the medium used? 2) Is training through the app as efficient as paper-based training? 3) Does gamification impact students' learning performance? Mixed model analyses revealed 1) a spelling training positive effect dependent on the initial level of participants, 2) a comparable efficiency between ECRIMO, used on a tablet independently by children, and the same training done with the teacher on paper, and 3) a gamification positive effect, but only for struggling students. This study proposes an original and relevant experimental design to test educational applications. It also highlights the importance of careful consideration of the design of the application, which can have a differential impact on students' learning depending on their initial skill level.

Session N 9

25 August 2023 14:45 - 16:15
UOM_A10
Single Paper
Higher Education, Learning and Social Interaction, Teaching and Teacher Education

Blended and Hybrid Learning

Keywords: Computer-assisted Learning, Digital Literacy and Learning, E-learning/ Online Learning, Educational Technologies, Higher Education, Instructional Design, Motivation, Peer Interaction, Qualitative Methods, Science and STEM, Self-regulated Learning and Behaviour, Social Interaction, Social Media, Teaching Approaches, Well-being
Interest group: SIG 04 - Higher Education, SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Panayiota Metallidou, Aristotle University of Thessaloniki, Greece

Blended Learning Quality as Crucial Factor for an Effective Flexible Learning Study Program
Keywords: E-learning/ Online Learning, Educational Technologies, Higher Education, Instructional Design
Presenting Author: Claude Müller, Zurich University of Applied Sciences, Switzerland; **Co-Author:**Thoralf Mildenberger, Zurich University of Applied Sciences, Switzerland; **Co-Author:**Daniel Steingruber, stid@zhaw.ch, Switzerland

Flexible learning addresses students’ needs for more flexibility and autonomy in shaping their learning process, and is often realised through online technologies. While higher education institutions are increasingly considering replacing classroom time and offering more blended learning, current research is limited regarding its effectiveness and modifying design factors. This study analysed a flexible study programme with 133 courses in different disciplines over more than four years with a mixed-methods approach. In the analysed flexible study programme (*N* students = 278), classroom instruction time was reduced by 51% and replaced with an online learning environment in a blended learning design. Student achievement was compared to the conventional study format (*N* students = 1068). The estimated summary effect size for the 133 flexible courses analysed was close to, but not significantly different from, zero (d = -0.0562, p = 0.3684). Although overall effectiveness was equivalent to the conventional study format, considerable variance in the effect sizes between the courses was observed. Based on the relative effect sizes of the courses and data from detailed analyses and surveys, heterogeneity can be explained by differences in the implementation quality of the educational design factors. Our results indicate that when implementing flexible study programmes in a blended learning format,

particular attention should be paid to the following educational design principles: adequate course structure and guidance for students, activating learning tasks, stimulating interaction and social presence of teachers, and timely feedback on learning process and outcomes.

Students' sidetalk in parallel to co-occuring teaching. Changing participation in hybrid classrooms
Keywords: Digital Literacy and Learning, Peer Interaction, Social Interaction, Social Media
Presenting Author: Fritjof Sahlström, University of Helsinki, Finland; **Co-Author:**Marie Nilsberth, Karlstad University, Sweden

This study takes an interest in how a new hybrid sociality changes classrooms as teaching and learning spaces, but also as social spaces where young people come together and engage in relations with peers.The aim is to analyze and contrast students' side-talk in classrooms at two different points of time, comparing data from non-digital classrooms in Sweden from the 1990's and more recent data from 2015/16 in Finland and Sweden when students had access to screen-mediated communication on their phones and laptops. The on-going digitalisation has reconstituted formerly analog classrooms as hybrid interactional spaces, where previously well understood and studied patterns of participation intertwine with massively present but less understood distributed sociality. The results indicate that the presence of screen-mediated sociality in classrooms fundamentally changes the character of student side-activities, where spoken student-student interaction in parallel to teaching seems in part to have been replaced by screen-mediated student interaction. These findings are in line with other current classroom studies. Our empirical finding supports the need for a theoretical reconceptualization of classroom participation patterns both for teachers and students, going beyond simplistic binary positions on banning or not banning students screens in schools. This reconceptualization has the potential for quite substantial practical implications for teaching and learning.

Reducing motivational costs of STEM students – a blended learning program in higher education
Keywords: Higher Education, Motivation, Science and STEM, Well-being
Presenting Author: Lena Sofie Kegel, Educational Psychology, University of Münster, Germany; **Co-Author:**Derya Turhan, Educational Psychology, University of Münster, Germany; **Co-Author:**Carola Grunschel, Educational Psychology, University of Münster, Germany

Several students report motivational challenges during their studies, wherefore interventions to support their motivation are relevant (Rosenzweig et al., 2022). Particularly, it requires interventions for reducing motivational costs (effort, emotional, and opportunity costs). Such costs negatively affect students' academic success and positive value interventions do not buffer these effects significantly (Kim et al., 2021). Therefore, we evaluated a nine-week intervention for motivational costs with a randomized control group design. Second-semester physics and mathematics students participated in this study. As high-performing students are typically those to seek counseling services (Falk & Marschall, 2011), we first examined whether participation in the study was subject to self-selection. Subsequently, we assessed whether the intervention group reported lower costs, higher expectations, positive value, and more study satisfaction after participation than the control group. Based on previous studies (Rosenzweig et al., 2020), we hypothesized that lower-performing students would benefit more from the intervention than higher-performing students. Results indicated that students with complete participation (n = 55) reported higher high school GPA, opportunity costs, effort, and study satisfaction in the pre-test compared to students with incomplete participation (n = 207). Repeated measures ANOVA based on pre- and post-test (n = 55) and pre- and follow-up-test (n = 45) revealed no differences in motivation or study satisfaction between the intervention and control groups. Moderation analyses showed no benefit of the intervention for lower-performing students. Future studies should aim to reach higher participation rates of lower-performing students to examine whether lower-performing students could benefit from the present intervention.

Hybrid learning as a tool to ensure education: a long-term perspective from German pilot schools
Keywords: Computer-assisted Learning, Qualitative Methods, Self-regulated Learning and Behaviour, Teaching Approaches
Presenting Author: Can Küplüce, Ruhr-University Bochum, Germany; **Presenting Author:**Denise Demski, Ruhr-University Bochum, Institute of Educational Sciences, Germany; **Co-Author:**Philipp Matthes, Ruhr-University Bochum, Institute of Educational Sciences, Germany; **Co-Author:**Grit Im Brahm, Ruhr-University Bochum, Institute of Educational Sciences, Germany; **Co-Author:**Gabriele Bellenberg, Ruhr-University Bochum, Institute of Educational Sciences, Germany

Recent events like the COVID-19 pandemic have led to drastic increases in online and hybrid learning environments. There is some evidence concerning the factors fostering or hindering the implementation and success of hybrid and online learning (e.g., Raccanello et al 2022; Tang et al., 2020). However, the significance and range of these findings for K-12 education may yet be limited, as data was often collected during times of crisis („emergency remote teaching") (Hodges et al. 2020) and/or specifically in higher education. We aim to fill this gap by analysing teaching and learning in three German project schools that implemented hybrid learning environments twenty years ago. To better understand the different factors expert teachers deem especially important for the long-term success of hybrid learning arrangements in schools we conducted think-alouds and semi-structured interviews with 16 educators working in the pilot project. A comprehensive Qualitative Content Analysis of the material shows that interviewees consistently experienced the long-term benefits of greater flexibility compared to regular in-class teaching, which enabled a larger number of students to achieve their educational goals. However, the expert teachers identify several core challenges beyond the initial implementation of the hybrid learning environment. These include a need for comprehensive changes in curricula, a stronger focus on self-regulated learning competencies and the need for flexible and personalised advanced training opportunities for teachers. Based on these findings we outline guidelines for a sustainable implementation of hybrid learning in times of crisis – and beyond.

Session N 10

25 August 2023 14:45 - 16:15
UOM_A08
Single Paper
Higher Education, Learning and Instructional Technology, Teaching and Teacher Education

Teachers and Teaching during the COVID-19 Pandemic I

Keywords: Developmental Processes, Digital Literacy and Learning, E-learning/ Online Learning, Early Childhood Education, Educational Technologies, Higher Education, In-service Teachers, Mentoring and Coaching, Mixed-method Research, Pandemic, Pre-service Teachers, Teacher Professional Development
Interest group: SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Elisabeth Mundt, University of Kassel, Germany

Teachers' online readiness in times of crises: Experience from Norway and US
Keywords: Digital Literacy and Learning, Educational Technologies, In-service Teachers, Teacher Professional Development
Presenting Author: Greta Björk Gudmundsdottir, University of Oslo, Faculty of Education. Department of Teacher Education and School Research., Norway; **Co-Author:**Dawn Hathaway, Georg Mason University, Division of Learning Technologies, School of Education, United States

The closing of schools world-wide in March 2020 due to the COVID-19 pandemic resulted in a rapid and unexpected shift from predominantly in-person teaching to online teaching practices. As teacher educators in the field of educational technology, we wondered about the readiness of teachers for making the transition to fully online environments. Through an internationally distributed survey consisting of predominantly open-ended questions, we captured teachers' perceptions of this transition. We aimed to inform our practice and that of other teacher educators about the strengths and weaknesses of professional development designed to develop teachers' digital competence. In this presentation we focus on data from Norwegian (n= 574) and US (n=239) teachers related to their elaborations on readiness. We qualitatively examined data for evidence of extent of preparedness and alignment to the pedagogical, ethical, attitudinal, and technical dimensions of digital competence. Findings indicated themes related to level of preparedness, influences on level of preparedness, digital tools, students' preparedness, teacher agency, lack of autonomy, collaboration/networks, and work-school-life balance. Findings informed implications and recommendations for the professional development of teachers' digital competence at the teacher education, schools, and school policy/leadership levels are presented.Keywords: Digital competence, teacher education, K-12 schools, online teaching, Nordic context, US context

Online Faculty Mentoring: Creating a holding environment in times of crisis

Keywords: Developmental Processes, E-learning/ Online Learning, Higher Education, Mentoring and Coaching
Presenting Author: Helga Dorner, Eötvös Loránd University, Hungary; **Co-Author:**Kinga Kaplar-Kodacsy, Eötvös Loránd University, Hungary

The paper explores online faculty mentoring grounded in a competency-based in-person mentoring model piloted in Hungary and encompassing a set of non-traditional relationships of professional peer, reverse and group mentoring (Káplár-Kodácsy & Dorner, 2020). The online mentoring aimed to increase the micro- and meso-level professional support provided for and by faculty members who wanted to better manage their instructional strategies and transfer lessons learned in teaching and learning to the post-covid era (Hannah & Lester, 2009). The aim of the study is to map the nature and experience of participation in online faculty mentoring, and to see how far this approach functions as a holding environment (Kahn, 2001) for the participating faculty members in their interpersonal or group-based relationships at work. Stakeholders of the mentoring system were involved from three levels of the organization in the individual semi-structured interviews: 1) leadership (n = 3), 2) mentor coordinators (n = 7), 3) mentors (n = 9) and mentees (n = 8) level. Twenty-seven interviews were coded by using thematic content analysis. As found, conditions for the establishment of a holding environment were primarily facilitated by task-focused roles, experiential inquiry, acceptance of the other, self-validation, and self-reflection. The organizational structure for vertical and horizontal transparency within the online network, clarification of roles as part of the mentoring process, and peer relationships among faculty members functioned as enabling factors to limit the risk of relationships of lacking holding and receiving interchange or to mitigate the complexity of instructionally overwhelming situations.

Teaching Practicum During Pandemic
Keywords: E-learning/ Online Learning, Early Childhood Education, Pandemic, Pre-service Teachers
Presenting Author: Seda Saraç, Bahcesehir University, Turkiye; **Co-Author:**Betül Tarhan, University of Georgia, United States; **Co-Author:**Hülya Gülay Ogelman, Sinop University, Turkiye

This study intends to shed light on the pandemic's effects on prospective preschool teachers' online practicum experiences. While the children were in-person with their class teachers, the prospective preschool teachers connected to preschool classes online. The participants in this phenomenological study were 18 prospective preschool teachers from Turkey who were enrolled in a public university. Individual interviews, microteaching observations, and portfolios were used to gather the data. Thematic content analysis was used for data analysis. The findings demonstrated that although prospective teachers encountered some technical difficulties, they nevertheless gained experience in teaching young children online and enhanced their digital literacy and understanding of technological pedagogical content. They were unable to grow their confidence as teachers for face-to-face instruction. Particularly, prospective preschool teachers voiced their worries about bonding with children and managing the classroom.

New methods; new insights: Making sense of teachers' experiences with online education
Keywords: E-learning/ Online Learning, Educational Technologies, Mixed-method Research, Pandemic
Presenting Author: Fazilat Siddiq, University of South-Eastern Norway, Norway; **Co-Author:**Jo Tondeur, Vrije Universiteit Brussel, Belgium; **Co-Author:**Sarah Howard, University of Wollongong, Australia; **Co-Author:**Ronny Scherer, University of Oslo, Norway

The Covid-19 pandemic provided a unique opportunity to understand school teachers' perceptions of and experiences with online practices on a large scale. However, there is a need for a more detailed understanding of the multiple associations among teachers' perceptions and experiences in change processes. Therefore, the main goal of the current study is to untangle the complexity of teachers' experiences and perceptions during this great online transition. Based on the data of 222 teachers' responses to open-ended questions, we used a combined method of thematic and network analysis. To illustrate this novel method, we will focus on the strongest associations between the categories "learning design for online teaching" and "Student learning". The results indicated for instance a strong association between 'Self-paced', which was a dimension of 'learning design', and 'Flexibility', which was discussed in relation to 'student experience'. During the presentation the authors will provide more examples of the associations between teachers' online experiences and perceptions. They will also demonstrate how the network model together with the thematic analysis can be used as a 'roadmap' towards a more integrated approach of online and blended learning in schools and to guide future professional development efforts and school policies.

Session N 11

25 August 2023 14:45 - 16:15
UOM_A04
Single Paper
Assessment and Evaluation, Culture, Morality, Religion and Education, Teaching and Teacher Education

Learning and Teaching in Culturally Diverse Settings

Keywords: Achievement, Attitudes and Beliefs, Classroom Assessment, Cultural Diversity in School, Developmental Processes, Educational Policy, In-service Teachers, Multicultural Education, Quantitative Methods, Self-concept, Social Aspects of Learning and Teaching, Social Development
Interest group: SIG 01 - Assessment and Evaluation, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Doris Kristina Raave, University of Tartu, Estonia

Linguistic, affective, and educational contributions to bicultural identity in minority adolescents
Keywords: Attitudes and Beliefs, Developmental Processes, Multicultural Education, Social Development
Presenting Author: Elisavet Chrysochoou, Aristotle University of Thessaloniki, Greece; **Co-Author:**Aleksandra Laketa, South East European Research Center (SEERC), Greece; **Co-Author:**Arvesa Studenica, South East European Research Center (SEERC), Greece; **Co-Author:**Ana B. Vivas, CITY College, University of York Europe Campus, Greece

The present study investigated linguistic, affective, and educational contributions to bicultural identity in two samples of younger (13- and 14-year-old; N = 95) and older (16- and 17-year-old; N = 67) bilingual adolescents, who are immigrants or belong to ethnic minority communities in the Balkans. While bicultural identity formation was not differentiated as a function of age group, there was an age-related shift in its predictors. Bicultural identity formation was significantly predicted by perceived educators' attitudes toward linguistic/cultural diversity in the younger group, and by personal affective states (motivation and attitudes) toward the mainstream language among the older adolescents. Implications of the findings are discussed within a positive youth development (psychological and social) framework, stressing the need for developmentally appropriate educational - besides family - practices that would support biculturalism among bilingual minority adolescents.

Beyond the Binary Classification– Testing a Disparity-Weighted Indicator of Cultural Diversity
Keywords: Achievement, Classroom Assessment, Cultural Diversity in School, Quantitative Methods
Presenting Author: Merle-Sophie Thielmann, University of Mannheim, Germany; **Co-Author:**Karina Karst, University of Mannheim, Germany; **Co-Author:**Benedict C. O. F. Fehringer, University of Mannheim, Germany

Theoretical predictions regarding the effects of cultural classroom diversity focus on various aspects of diversity. Beyond the proportion of students with a migrant background, the number of different origin countries, their relative proportions in the classroom and the cultural similarity of countries might affect student achievement through different mediating processes (Rjosk et al., 2017). However, currently established measures of diversity do not fully capture this complexity. This study tests a weighted indicator of cultural diversity that includes the similarity of origin countries on two cultural dimensions. Using a dataset of N=1614 fifth-graders, we compare this indicator to established diversity measures like minority proportion, number of origin countries and Simpson'sD and test it as a predictor of individual students' reading achievement using multilevel models. The weighted indicator shows comparatively small correlations to established diversity measures ($0.23 \leq r \leq 0.79$). We found a significant composition effect of diversity on reading achievement using both established diversity measures ($-0.11 \leq \beta \leq -0.06$) and the weighted index ($\beta = -.07$, $p < .05$). We discuss the potential of weighted diversity indices in further exploring current mixed empirical and theoretical findings.

Conditions for the implementation of intercultural practices in educational settings in Portugal

Keywords: Cultural Diversity in School, Educational Policy, Multicultural Education, Social Aspects of Learning and Teaching
Presenting Author: Rui Maio, Faculty of Psychology and Educational Sciences of the University of Porto, Portugal; **Co-Author:**Sofia Guichard, University of Porto - Faculty of Psychology and Educational Sciences, Portugal; **Co-Author:**Joana Cadima, University of Porto, Portugal

Although intercultural practices are believed to be extremely relevant to combat educational disadvantages, evidence on the factors that are related to their implementation is not yet well established. This study aimed to deepen the understanding regarding the implementation of intercultural practices by professionals working in disadvantaged and culturally diverse contexts in Portugal, examining its association with the institution's socioeconomic and cultural diversity, organizational climate and professionals' self-efficacy and job satisfaction. Participants were 78 professionals (95.3% female, with an age average of 42.52, 64.1% primary school teachers). Self-efficacy was positively associated with the use of intercultural practices, while higher concentration of Roma and low-income children were negatively associated with the implementation of intercultural practices, self-efficacy, and job satisfaction. A supportive organizational climate was positively associated with professionals' sense of efficacy and job satisfaction. Findings highlight the importance of promoting a positive organizational climate and helping professionals to effectively handle diversity, namely by providing conditions to improve their levels of self-efficacy.

Multiply Marginalized and Underrepresented Teachers' Intersecting Identities
Keywords: Cultural Diversity in School, In-service Teachers, Self-concept, Social Aspects of Learning and Teaching
Presenting Author: Ji Hong, University of Arizona, United States; **Presenting Author:**Dionne Cross Francis, University of North Carolina at Chapel Hill, United States; **Co-Author:**Faqryza Ab Latif, University of Arizona, United States; **Co-Author:**Taylor Roloff, University of Arizona, United States; **Co-Author:**Kelly Chong, Round Rock Children's Therapy Center, United States; **Co-Author:**Paul Schutz, University of Arizona, United States

Multiply marginalized and underrepresented (MMU) teachers often face significant challenges due to the social inequities that plague our educational landscape. Our research explores how MMU teachers configure and negotiate their intersecting identities of race, gender, and sexuality as they navigate complex school and societal contexts. Using a narrative inquiry framework, nine MMU teachers were interviewed in depth to generate narrative threads composed of emerging meaning units that highlighted their nuanced experiences. Three major themes emerged: (1) Normalization of dominant racial identities (e.g., white) in intersections with marginalized identities (e.g., lesbian) (2) Microaggressions as tools for undermining minoritized identities, and (3) Exercising agency, persistence, and resistance to claim identity spaces. This study reveals the hidden challenges of MMU teachers, provide insights into the nature of intersecting identities, and make visible the agency MMU teachers employ to create equitable spaces for marginalized identities. By deepening our understanding of the experiences of MMU teachers, these findings can inform approaches designed to support and empower MMU teachers as they navigate school and societal contexts, ultimately increasing MMU teacher retention.

Session N 12

25 August 2023 14:45 - 16:15
UOM_A05
Single Paper
Teaching and Teacher Education

Choosing the Teaching Profession, Preparedness and Future Vision

Keywords: Attitudes and Beliefs, Communities of Learners and/or Practice, Educational Policy, In-service Teachers, Learning Approaches, Motivation, Pre-service Teachers, Primary Education, Qualitative Methods, Sustainable Development, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Rui WANG, University of Cambridge, China

Who becomes a teacher and why?
Keywords: Attitudes and Beliefs, Educational Policy, In-service Teachers, Pre-service Teachers
Presenting Author: Elaine Munthe, University of Stavanger, Norway; **Co-Author:**Beng Huat See, Durham University, School of Education, United Kingdom; **Co-Author:**Sarah Ross, Durham University, United Kingdom; **Co-Author:**Loraine Hitt, Durham University, School of Education, United Kingdom; **Co-Author:**Nada El Soufi, Durham University, School of Education, United Kingdom

This paper reports on a comprehensive review of international evidence, synthesising the findings of some of the strongest empirical work on the main factors influencing people's decisions to be teachers or not. Four search engines, including Google and Google Scholar and five electronic databases identified 517 studies of which 212 were included in this narrative synthesis. These studies highlighted three main motivating factors: intrinsic, altruistic and extrinsic, although the order of the ranking varies with subjects, phase of education and gender of teachers. In general, these studies reported that women are more likely to report being motivated by intrinsic and altruistic reasons, while men are more likely to cite extrinsic reasons. Across all cultures, men are reported to be more strongly influenced by social norms and expectations and were less likely to choose primary and early years teaching. Women are also more likely to experience higher levels of career satisfaction and less social dissuasion than men. Research on motivation to teach is also often focused only on those who have already made the decision to teach. Therefore, policies based on these studies might only be attracting those who are already persuaded. This paper argues that to improve recruitment of under-represented groups (e.g. males and STEM subject graduates), attention should instead be on those who might otherwise have gone into teaching, but have not. For this group, the review found that it is the status of the profession, the working environment and salary over the long-term that are important.

Do student teachers' FIT-Choice motives explain how they study during teacher education?
Keywords: Learning Approaches, Motivation, Pre-service Teachers, Teacher Professional Development
Presenting Author: Michael Goller, University of Kassel, Germany; **Co-Author:**Carina Caruso, University of Paderborn, Germany; **Co-Author:**Heidi Hyytinen, University of Helsinki, Finland; **Co-Author:**Jani Ursin, University of Jyväskylä, Finland; **Co-Author:**Katja Vähäsantanen, Häme University of Applied Sciences, Finland

Aim of this study is to investigate whether student teachers' career-choice motivations explain differences in their learning processes and strategies during teacher education at university. For this purpose, a study with two measurement points was conducted (T1 measured FIT-Choice motives and three months later T2 included measures on study behaviours to avoid common method bias). The final data consist of 234 bachelor students' survey responses from a single German university that took part in both measurement points. A Latent Profile Analysis (LPA) resulted in two profiles that differ in why students chose to enrol in their teacher education programme and to become teachers (students in profile 1 indicate mostly higher social utility values than students in profile 2). Further findings suggest that students in profile 1 exhibit more often certain learning strategies than students in profile 2. Implications for practice and research will be discussed.

Investigating the Impact of a Year-Long Internship on Candidates' Perceptions of Preparedness
Keywords: Attitudes and Beliefs, Communities of Learners and/or Practice, Pre-service Teachers, Primary Education
Presenting Author: Michael Putman, University of North Carolina Charlotte, United States

As educator preparation programs seek to develop professionally competent teachers, an essential component within this process is the field experience. This research reports on a three year project involving the implementation of a coordinated, year-long internship founded on principles associated with situated learning theory and effective educator preparation. Research questions focused on the extent the organisational facets of the field experiences influenced candidates' perceptions of their preparation and how these perceptions were associated with elements of a community of practice. Notably, the three years of implementation encompassed those before (2018-2019), during (2019-2020), and immediately following (2020-2021) circumstances associated within COVID-19 pandemic and the related modifications to instructional delivery in K-12 schools and universities. Overall, findings demonstrated the importance of candidates building relationships with supervising teachers and peers, with elements of the community of practice inherently demonstrated within these relationships, and

the impact of opportunities for the direct teaching practice in authentic contexts, regardless of instructional modality, as dictated by conditions associated with the pandemic. The findings of this research project are of critical importance to the field as universities seek to ensure post-pandemic opportunities for teacher education candidates to create field experiences that positively impact candidates, regardless of instructional modality or the capacity of candidates to participate in in-school experiences.

Future Vision of Teacher Education Students
Keywords: Pre-service Teachers, Qualitative Methods, Sustainable Development, Teacher Professional Development
Presenting Author: Christian Kraler, Teacher Education and School Research, Austria; **Presenting Author:**Sabrina Bacher, University of Innsbruck, Austria, Austria; **Presenting Author:**Claudia Schreiner, University of Innsbruck, Austria

Teachers are a glimmer of hope in the current time of uncertainty. There is a long tradition in arguing the importance of teachers for society and its development. With regard to the urging global societal and environmental challenges (Steger 2020, Beck 2000, De Haas et al. 2019, Barry 2005, Rosa 2015) but also ideas to tackle them (e.g., Sustainable Development Goals), the importance of future visions of teachers becomes apparent. Teachers' beliefs have a high influence on their teaching, independently from curriculum directives. (Positive) Future visions can create hope (Ginevra, Sgaramella et al. 2017) and activate people to develop and implement solutions (Jørgensen, Grosu 2007) to current challenges. In the presented study, we reconstruct teacher education students' visions of the future in general as well as their future visions of learning and teaching. The study involves 100 teacher education students on the master's level. We chose an open, explanatory freewriting approach (micro-articles) to provide room for emotional expression and creativity. Preliminary analyses of students' texts show a wide variety of themes, approaches, and dispositions in describing their future visions. Recurring themes are technology, digitalization, and climate change, but also the need for social relationships and schools as a social space.

Session N 13

25 August 2023 14:45 - 16:15
AUTH_DC3
Single Paper
Developmental Aspects of Instruction, Learning and Instructional Technology, Teaching and Teacher Education

Secondary Education Students' Mathematical Thinking

Keywords: Assessment Methods, Cognitive Skills and Processes, Computer-assisted Learning, Educational Technologies, In-service Teachers, Mathematics/Numeracy, Pre-service Teachers, Problem Solving, Qualitative Methods, Secondary Education, Teacher Professional Development
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Alfredo Jornet, Universitat de Girona, Spain

On noticing and framing of student mathematical thinking
Keywords: Mathematics/Numeracy, Pre-service Teachers, Secondary Education, Teacher Professional Development
Presenting Author: Thorsten Scheiner, Institute for Learning Sciences and Teacher Education, Australia

Noticing students' mathematical thinking is a complex skill that prospective teachers need to learn. To this end, a teacher education course was designed to engage prospective mathematics teachers in critically reflecting on their individual and collectively shared framings of students' mathematical thinking, thereby effecting a change in their orientations in noticing. This study identifies teachers' framings of students' thinking and examines the nature and development of teachers' noticing of students' thinking. Specifically, the study identifies a typology of deficit-oriented and strength-oriented framings in noticing students' mathematical thinking and demonstrates how shifts in framings promote changes in prospective teachers' attention, interpretation, and response to students' thinking.

Eliciting and Attending to Students' Mathematical Thinking in Clinical Interviews
Keywords: In-service Teachers, Mathematics/Numeracy, Qualitative Methods, Teacher Professional Development
Presenting Author: Nicora Placa, Hunter College, City University of New York, United States

Understanding how to elicit and attend to student thinking is a critical component of ambitious mathematics teaching. Clinical interviews are one professional development tool that can support teachers in developing these practices. Using cross-case study methodology, this study analyzed transcripts of three educators' clinical interviews and their reflections to explore the ways in which they elicited and attended to student thinking when conducting clinical interviews. Findings show that while the educators were successful in asking probing questions and engaging in observational listening, they also faced challenges in moving toward responsive listening, particularly when students struggled with providing justification for a task. Implications for teacher educators suggest that teachers may need support in developing more nuanced and specific prompts to elicit conceptual understanding as they engage in clinical interviews. They may also consider providing teachers with suggestions on how to provide students with tools to justify their thinking as they engage in clinical interviews.

Is the correlation between fraction and algebra knowledge based more on concepts than procedures?
Keywords: Assessment Methods, Cognitive Skills and Processes, Mathematics/Numeracy, Secondary Education
Presenting Author: Claire Forsmann, University of Trier, Germany; **Co-Author:**Michael D'Erchie, Technichal University of Munich, Germany; **Co-Author:**Andreas Obersteiner, Technical University of Munich, Germany; **Co-Author:**Michael Schneider, University of Trier, Germany

Studies suggest that high-school students' fraction knowledge predicts their algebra (e.g., equation solving) knowledge. However, it is not well understood specifically how conceptual and procedural knowledge of fractions and conceptual and procedural knowledge of algebra are related to each other and how this relationship develops over time. We have designed a study (1) to develop test instruments that assess each of these four knowledge facets validly, reliably, and independently of each other and (2) to investigate the underlying factor structure using these instruments. We hypothesized that this is a four-factor structure with inter-correlated latent factors for fraction concepts (FC) and fraction procedural knowledge (FP) and equation-solving concepts (EC) and equation-solving procedural knowledge (EP). The final sample will consist of 200 German ninth graders. The data collection is ongoing. The preliminary results showed that item characteristics were acceptable for most items, although some items needed revision due to ceiling effects. A confirmatory factor analysis (CFA) indicated an acceptable fit of the presumed four-factor model, which aligns with previous findings for a two-factor model for fractions and a two-factor model for equation solving. Conceptual knowledge of fractions and algebra was more strongly intercorrelated (r = .88) than procedural knowledge of fractions and algebra (r = .35). The results from this study will be used to improve measures for conceptual and procedural knowledge of fractions and equation solving to be used in future longitudinal studies on the mediators between fraction and algebra concepts and procedures.

The trade-off between complexity and accuracy in computer-based adaptive instruction on fractions
Keywords: Computer-assisted Learning, Educational Technologies, Mathematics/Numeracy, Problem Solving
Presenting Author: Timo Leuders, University of Education Freiburg, Germany; **Co-Author:**Antje Boomgaarden, University of Education Freiburg, Germany; **Co-Author:**Katharina Loibl, University of Education Freiburg, Germany

PS-I learning approaches with an initial problem-solving phase (PS) followed by an instruction phase (I) can be optimised by providing adaptive (individualised) instruction that builds on students' problem-solving products. A computer-based implementation of both phases offers the possibility of adaptivity at the transition from the problem-solving to the instruction phase. However, it also poses two challenges for the problem-solving phase, which should allow for (1) complex problem-solving processes (process validity) and (2) accurate diagnosis of problem-solving products. Increased openness of the learning environment can increase the process validity and decrease diagnostic accuracy and vice-versa (complexity-accuracy trade-off). Using two variants of a computer-based learning environment for fraction comparison with different extent of openness (O+ and O-), we investigate whether both requirements (complex problem-solving processes and accurate diagnosis of the problem-solving products) can be met simultaneously. To check process validity (complexity of problem-solving processes), we compare the problem-solving products with those from previous research on an analogous paper-based version. Our results show that valid and

comparable problem-solving processes can be achieved in both computer-based learning environments (O+ and O-). Moreover, only the learning environment O- enables an accurate computer-based interpretation of students' products and thus resolving the complexity-accuracy trade-off.

Session N 14

25 August 2023 14:45 - 16:15
UOM_R05
Single Paper
Culture, Morality, Religion and Education, Higher Education, Teaching and Teacher Education

Education for Sustainable Development

Keywords: Environmental Education, Higher Education, Instructional Design, Learning Approaches, Primary Education, Qualitative Methods, School Leadership, Science and STEM, Secondary Education, Self-regulated Learning and Behaviour, Sustainable Development, Teacher Professional Development
Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education, SIG 25 - Educational Theory
Chairperson: Charleen Brand, Ruhr University Bochum, Institute of Educational Research, Germany

A Systematic Review on Sustainable Educational Innovations: The Role of (Distributed) Leadership
Keywords: Primary Education, School Leadership, Secondary Education, Sustainable Development
Presenting Author: Christa Krijgsman, Fontys Hogeschool/Kenniscentrum Youth Education for Society, Netherlands; **Co-Author:**Marco Snoek, Hogeschool van Amsterdam, Netherlands; **Co-Author:**Marieke Thurlings, Eindhoven University of Technology, Netherlands

Using the lens of the conceptual model of sustainable innovation (Rikkerink et al., 2016), the present systematic literature review addresses the following research question: How does (distributed) leadership, in interplay with contextual, relational and individual conditions at the micro, meso and macro level, influence the sustainability of educational innovations at the primary process in primary and secondary education? A meta-aggregative approach to Qualitative Evidence Synthesis (QES) was deployed. Based on 43 selected studies, findings show that the role of (distributed) leadership at the school, district and national level is to support teachers as key actors in creating sustainable educational innovations. Leaders play an important role regarding contextual, relational and individual conditions at the meso (e.g., collaborative learning) and macro (e.g., alignment district and school vision and methods) level. As the micro level focuses on teachers in classrooms, original articles did not report conditions related to (distributed) leadership. Other contextual, relational and individual conditions not linked to leadership, such as teachers experiencing growth in their own competencies that are relevant for the innovation (i.e., individual condition, micro level), are presented. The results of the present QES show that a systemic perspective on sustaining educational innovations is in place: it is not about fragmented conditions that are shown to promote sustained innovations, but it is about balancing the various conditions that are linked to each other and that are the sum of their parts. Six recommendations for educational leaders are provided.

Sustainability and STEM Education: STEM Teachers' contextualization of sustainable development goals
Keywords: Instructional Design, Science and STEM, Sustainable Development, Teacher Professional Development
Presenting Author: Zerrin Doganca Kucuk, Maynooth University, Ireland; **Co-Author:**Defne Yabas, Bahcesehir University, Turkiye; **Co-Author:**Gaye Defne Ceyhan, Bogazici University, Turkiye; **Co-Author:**Mehmet Sencer Corlu, Oslo Metropolitan University, Norway

Sustainable development goals (SDGs) present major global challenges, including complexity and uncertainty. From an educational point of view, the SDGs present a rich context for meaningful learning experiences. An integrated STEM approach can be proposed to teach and achieve SDGs. In this research, we investigated the implemented lesson plans of teachers who participated in a STEM professional development program, considering the context of their designs and which SDGs they focused on. SDG11 (Sustainable cities and communities) and SDG 12 (Responsible consumption & production) were the most frequently addressed SDGs. Regarding how the STEM teachers integrated SDGs into their LPs, they mostly contextualized SDGs at the individual level. The teachers also designed their LPs around more local issues to present more familiar contexts for students.

Pedagogical Pattern Navigator in Education for Sustainable Development
Keywords: Higher Education, Instructional Design, Qualitative Methods, Sustainable Development
Presenting Author: Bernadette Dilger, University of St.Gallen, Switzerland

The Pedagogical Pattern Navigator in Education for Sustainable Development (ESD) is a support for faculty to enhance their teaching and students learning. Faculty can make use of pedagogical patterns in ESD to guide and further develop their own teaching. Using the Pedagogical Pattern approach in ESD, faculty is enabled to address ESD specific learning objectives in constructive alignment to pedagogical methodologies and assessments. The Pedagogical Pattern Navigator is developed in a design based research approach and tested with faculty in a business and economics university. It is organized around specific categories of needs in ESD (for example fostering value discussions and ambivalence in dilemma situations). Faculty can choose their prioritized access (through specified needs, classes of learning objectives, prioritized pedagogical methodologies or assessment criteria). Following their first choice, the Pedagogical Pattern Navigator suggest the aligned pedagogical design decisions (e.g., the appropriate pedagogical method and applicable assessment criteria). The proposed patterns are explained by typical descriptions, critical incidents, and ideas for variations.

The Necessity of Utopia for Education for Sustainable Development
Keywords: Environmental Education, Learning Approaches, Self-regulated Learning and Behaviour, Sustainable Development
Presenting Author: Yves Mühlematter, PHBern, University of Teacher Education; University of Zürich, Switzerland

The presentation discusses the entanglements between neoliberalism, democracy and education for sustainable development. It shows that the ESD discourse, despite the post-growth debate, is essentially shaped by neoliberalist growth discourses. The paper outlines these lines of discourse and identifies in them two currents running in opposite directions. This serves as a starting point for a meta-discussion on ideas of the future and their role in ESD. Starting from an approach that understands "utopia as method" (Levitas, 2013), different alternatives will be discussed and it will be worked out why ESD cannot do without "utopia". This will be followed by considerations of what this could mean for ESD didactics.

Session N 15

25 August 2023 14:45 - 16:15
UOM_A11
Single Paper
Higher Education, Teaching and Teacher Education

Teachers' Professional Development: Reciprocal Peer Observation and Team Teaching

Keywords: Attitudes and Beliefs, Higher Education, In-service Teachers, Mixed-method Research, Peer Interaction, Primary Education, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development
Chairperson: Georg Krammer, Austria

Teachers' closeness of professional relationships and learning in reciprocal peer observation
Keywords: In-service Teachers, Mixed-method Research, Peer Interaction, Teacher Professional Development
Presenting Author: Jesús Ribosa, UAB Universitat Autònoma de Barcelona, Spain; **Co-Author:**Ingrid Noguera, UAB Universitat Autònoma de Barcelona, Spain; **Co-Author:**Meritxell Monguillot, UB Universitat de Barcelona, Spain; **Co-Author:**Begoña De la Iglesia Mayol, Universitat de les Illes Balears, Spain

In education, the closeness of relationships has been addressed in research on teacher-student relationships, but it is scarce when it comes to teacher-teacher

relationships. This study analyses: 1) whether a collaborative teaching practice (i.e., reciprocal peer observation) helps teachers increase their perceived closeness of professional relationship with their partner, and 2) whether initial and final levels of closeness influence teachers' professional learning perception after reciprocal peer observation. 370 primary and secondary education teachers took part in the intervention. Pretest-posttest results show that participants significantly increased the closeness of professional relationship, with strong effects for those with low or medium initial levels. Following a participatory research method, a random sample of participants was invited to take part in group interviews to interpret these findings. A total of 63 teachers divided into four group interviews participated. Content analysis of the recordings resulted into five relevant factors to increasing teachers' closeness of professional relationships, namely knowledge sharing, feedback, personal bond, mutual help, and commitment. Teachers' professional learning perception was gathered through a final questionnaire. The scores of professional learning perception between low-, medium- and high-level groups of initial and final closeness were compared. As for initial closeness, the low-level group showed a lower learning perception. As for final closeness, differences were significant between the three groups: the higher the final closeness, the higher the learning perception. Future studies will have to analyse what happens in the reciprocal peer observation process to help understand the factors that promote teacher closeness and learning.

Impact of Reciprocal Peer Observation on teacher perception of collaboration among teachers
Keywords: Attitudes and Beliefs, In-service Teachers, Peer Interaction, Teacher Professional Development
Presenting Author: Ester Miquel, Universitat Autonoma de Barcelona, Spain; **Co-Author:**Mariona Corcelles, Universitat Ramon Llull, Spain; **Co-Author:**Íngrid Sala, Universitat Ramon Llull, Spain; **Co-Author:**Mireia Soler, Universitat Autònoma de Barcelona, Spain; **Co-Author:**David Duran Gisbert, Universitat Autònoma de Barcelona, Spain

One of the main educational challenges today is to improve teacher collaboration at schools. The present study aims to analyze the impact of one of the forms of teacher professional collaboration—reciprocal peer observation (RPO)—on reducing teachers' resistance to peer observation and improving teachers' perception of collaboration among teachers at the school context. An intervention design with pre-post measures was applied to 400 in-service teachers from 123 Spanish schools. All participants had been trained in the peer observation protocol and implemented RPO at least twice: in one round performing the role of observee and in another round performing the role of observer. The Teachers' Resistance to Peer Observation Scale and Teacher Collaboration Questionnaire were applied before and after the RPO intervention. Results show a significant reduction in teachers' resistance to the observer and observee role, and a significant improvement in teachers' perception of collaborative collegiality, teachers' willingness to work collaboratively and teachers' agency through collaboration after RPO. No changes were found in teachers' resistance to collaboration and in their perceived relevance of collaborative professional practices. Overall, the study shows that RPO has a significant impact on teachers' perception of collaboration among teachers. Therefore, promoting this form of collaborative professional practice at school can be a mechanism for increasing teachers' willingness to collaborative work, which has been reported in literature to benefit not only student achievement but also overall school performance.

Professional development: Teachers' reasons for peer selection for classroom observations
Keywords: Higher Education, Mixed-method Research, Peer Interaction, Teacher Professional Development
Presenting Author: Irene Douwes-van Ark, University of Groningen, Netherlands; **Co-Author:**Jasperina Brouwer, University of Groningen, Netherlands; **Co-Author:**Ine Noben, University of Groningen, Netherlands

Teachers observing each other's class was part of a professional development programme for university teachers in the Netherlands. A side-effect of such development programmes is that teachers establish their social capital referring to social resources within a network, which can be used to obtain individual goals. The current study focuses on teachers' social capital development and teachers' reasons for peer selection before participating in classroom observations. The sample consisted of 15 language teachers from a research university in the Netherlands. They participated in a social network survey study combined with in-depth interviews. The social network results show that the density increases from the first semester to the second semester. This implies that teachers establish more connections with their colleagues over time. Reciprocity and transitivity also increase, implying that teachers have more mutual relationships and that the relationships become more clustered ("a friend of a friend is a friend"). The interviews show that teachers mention epistemic reasons to select their peers for observation, such as sharing expertise, but are hampered by organizational factors (i.e., a mismatch with the planning and work pressure). These results provide a better understanding of the personal drivers for and organizational obstacles of participating in peer observation.

The teaching behaviour of beginning team teachers at the beginning of a team teaching intervention
Keywords: In-service Teachers, Primary Education, Teacher Professional Development, Teaching/Instructional Strategies
Presenting Author: Dries Mariën, University of Antwerp, Belgium; **Co-Author:**Elke Struyf, University of Antwerp, Belgium; **Co-Author:**Ruben Vanderlinde, Ghent University, Belgium; **Co-Author:**Hanne Tack, Ghent University, Belgium

Team teaching is considered a promising professional development strategy in which teachers are committed to collaborating, sharing expertise, supporting each other, learning collaboratively, and enhancing their competences to deal with students' different needs. However, little is known regarding the changes in their teaching behaviour compared to teaching solo previously, especially when experienced teachers are beginners in a team teaching context. Consequently, the present study aims to advance insight in the initial teaching behaviour of beginning team teachers in primary education at the beginning of a team teaching intervention. A mixed-method research design is used by combining video-observation and team interviews by 16 beginning team teaching teams, consisting of 33 primary teachers. Results show that team teaching is mainly used for more complex skills such as activating teaching and differentiated instruction. The more basic skills, such as, learning climate, classroom organisation, clarity of instruction, are more embedded during traditional lessons.

Session N 16

25 August 2023 14:45 - 16:15
UOM_A06
Single Paper
Learning and Instructional Technology

Learning Analytics in Self-regulated Learning

Keywords: Developmental Processes, Educational Technologies, Game-based Learning, Inquiry Learning, Learning Analytics, Self-regulated Learning and Behaviour, Writing/Literacy
Interest group: SIG 16 - Metacognition and Self-Regulated Learning, SIG 20 - Inquiry Learning, SIG 27 - Online Measures of Learning Processes
Chairperson: Margarida Margarida Romero, France

Understanding and supporting writing processes with trace data
Keywords: Educational Technologies, Learning Analytics, Self-regulated Learning and Behaviour, Writing/Literacy
Presenting Author: Lyn Lim, Technical University of Munich, Germany; **Co-Author:**Mladen Raković, Monash University, Australia; **Co-Author:**Sehrish Iqbal, Monash University, Australia; **Co-Author:**Tongguang Li, Monash University, Australia; **Co-Author:**Yizhou Fan, Peking University, China; **Co-Author:**Shaveen Singh, Monash University, Australia; **Co-Author:**Surya Surendrannair, Monash University, Australia; **Co-Author:**Jonathan Kilgour, Edinburgh University, United Kingdom; **Co-Author:**Joep van der Graaf, Radboud University Nijmegen, Netherlands; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany; **Co-Author:**Johanna Moore, Edinburgh University, United Kingdom; **Co-Author:**Dragan Gasevic, Monash University, Australia

Writing from multiple sources is a popular learning task across different disciplines and writing genres. However, many students find this task challenging as they struggle to self-regulate multiple cognitive and metacognitive processes in this task. This often leads to low performance in essay writing tasks. To help students improve their self-regulation and performance in multi-source writing, educators may tailor their feedback focusing on (1) characteristics of self-regulatory processes students enacted during the task, and (2) characteristics of texts students wrote when engaged in those processes. For this reason, understanding both writing processes and products may help educators set a stage for a more comprehensive feedback on writing. Methods in learning

analytics that allow for tracing student learning behaviors in online platforms and for analysing educational texts can be harnessed to advance understanding of writing processes and products, and to inform at-scale formative feedback to students. We are conducting an LA study observing students' cognitive and metacognitive processes and written products as they worked on an essay writing task. We report on our progress in this extended summary. We collected multimodal trace data that students generated in an online learning platform, including timestamped navigational logs, keystrokes, and mouse clicks. Informed by prior theoretical and empirical works, we identified a set of process- and product-related features, and used those features to develop the Random Forest machine learning model. This model correctly detected around 77% of low-performing essays. We further examined process and product features that were important predictors of essay performance.

Evaluating the Effectiveness of Personalized Scaffoldings on SRL using Ordered Network Analysis
Keywords: Educational Technologies, Learning Analytics, Self-regulated Learning and Behaviour, Writing/Literacy
Presenting Author: Yizhou Fan, Peking University, China; **Co-Author:**Tongguang Li, Monash University, Australia; **Co-Author:**Yuanru Tan, University of Wisconsin-Madison, United States; **Co-Author:**Mladen Raković, Monash University, Australia; **Co-Author:**Joep van der Graaf, Radboud University Nijmegen, Netherlands; **Co-Author:**Lyn Lim, Technical University of Munich, Germany; **Co-Author:**Shaveen Singh, Monash University, Australia; **Co-Author:**Johanna Moore, University of Edinburgh, United Kingdom; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany; **Co-Author:**Dragan Gasevic, Monash University, Australia

Self-regulated learning (SRL) describes learners' ability to regulate their cognitive, metacognitive, motivational, and emotional factors in learning, and is posited to be a strong predictor of academic success. It is therefore important to provide learners with effective instruction to improve more meaningful and effective SRL activities. One way to implement SRL instruction is through providing realtime personalized scaffolding while learners engage in the task. However, the effectiveness of personalized scaffolding, in the current literature, has primarily been examined and explained in terms of associations with academic performance, while insufficient studies have addressed the effectiveness in relation to changes in SRL processes either at the the coarse-grained level (i.e. the task level) or fine-grained level (i.e. the segmented task level). To address these gaps, this study designed and developed a multi-source writing task, and used a cutting-edge analytic method – ordered network analysis (ONA) – to model, visualize, and explain how learners' SRL processes changed in relation to the scaffolds at both task level and segmented task level. The study results showed that personalized scaffolds are effective in 1) encouraging learners to adopt diverse SRL processes, 2) facilitating meaningful reading and writing tactics, and 3) urging and facilitating early engagement in SRL processes. This study demonstrates a significant novelty in not only deepening our understanding of the effects of scaffolding at the segmented task level, but also in using a contemporary network analysis technique in evaluating the effects of personalized scaffolding on learners' SRL processes.

Promoting effective use of domain information in simulation-based scientific inquiry learning
Keywords: Educational Technologies, Inquiry Learning, Learning Analytics, Self-regulated Learning and Behaviour
Presenting Author: Mari Fukuda, Simon Fraser University, Canada; **Co-Author:**John Nesbit, Simon Fraser University, Canada; **Co-Author:**Philip Winne, Simon Fraser University, Canada

For inquiry learning to be effective, appropriate support is crucial. Although providing supplementary text about the domain is a common means of support, research shows learners often do not use that information effectively. This ongoing study investigates effects of two interventions (just-in-time inquiry prompts, P+; pretask and posttask directions to explain domain concepts, E+) on learners' frequency of accessing, selecting, and processing domain information. Thirty-four undergraduates were randomly assigned to four groups: (1) P+E+, (2) P+E-, (3) P-E+, or (4) P-E-. In a one-on-one online experiment, participants engaged in inquiry learning with a website providing a DC circuit simulation, information text, and text answer fields. Analysis of their information access behaviour, traced as log data, revealed that explanation directions increased learners' text access and reading durations. Process mining indicated the groups receiving explanation directions showed more transitions between conceptual texts that needed to be referenced together for better understanding, such as the texts about electrons and current. Consequently, acquisition of domain-specific concepts and laws assessed by the posttest was higher in both explanation direction groups than groups without such support. Future analytical possibilities are discussed.

Developmental Differences in Students' Self-Regulated Learning with Game-based Learning Environments
Keywords: Developmental Processes, Game-based Learning, Learning Analytics, Self-regulated Learning and Behaviour
Presenting Author: Saerok Park, University of Central Florida, United States; **Co-Author:**Daryn Dever, University of Central Florida, United States; **Co-Author:**Megan Wiedbusch, University of Central Florida, United States; **Co-Author:**Roger Azevedo, University of Central Florida, United States

Learners develop their self-regulated learning (SRL) abilities over time and use different SRL skills in game-based learning environments (GBLEs). To explore SRL based on learners' developmental levels in GBLEs, 26 high school and 26 undergraduate students participated in learning microbiology with Crystal Island. Pre-test scores, post-test scores, and log-file data were collected and analyzed to identify differences on learning outcomes and SRL skills in GBLEs based on developmental levels. Results show that undergraduates were more likely to solve a mystery than high school students in Crystal Island despite no significant differences in learning gains measured by normalized change scores. Furthermore, the frequency and duration of SRL strategies were larger for undergraduate students compared to high school students. Our findings make a significant theoretical contribution by showing how SRL models should take developmental differences into account when making monitoring or strategy-use assumptions. Additionally, this work highlights instructional implications for GBLEs by showing the positive aspects of providing scaffoldings based on learners' developmental levels.

Session N 17

25 August 2023 14:45 - 16:15
UOM_A13
Single Paper
Higher Education, Learning and Social Interaction, Lifelong Learning

Team Work in Different Educational Settings

Keywords: Communities of Learners and/or Practice, Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, E-learning/ Online Learning, Early Childhood Education, Higher Education, Learning Approaches, Lifelong Learning, Quantitative Methods, Resilience, Science and STEM, Self-regulated Learning and Behaviour, Teaching Approaches
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 14 - Learning and Professional Development
Chairperson: Carlos González, Pontificia Universidad Católica de Chile, Chile

Physics and Engineering Students' Teamwork: Examining Boundary Processes
Keywords: Communities of Learners and/or Practice, Cooperative/Collaborative Learning, Higher Education, Science and STEM
Presenting Author: Canan Mesutoglu, Erasmus University Rotterdam, Netherlands; **Co-Author:**Dury Bayram-Jacobs, Eindhoven University of Technology, Netherlands; **Co-Author:**Annemieke Vennix, Eindhoven University of Technology, Netherlands; **Co-Author:**Jan van der Veen, Eindhoven University of Technology, Netherlands

One of the features of innovative learning environments is student collaboration in designing solutions to complex, real-life problems. Teamwork of science and engineering students enhance their vision in understanding and appreciating multiple disciplinary perspectives. Prior research addresses a need to better understand how and when students successfully connect their disciplinary perspectives during teamwork. This research undertook a case-study approach and used Communities of Practice theory to explore how applied physics and mechanical engineering students communicated and coordinated their disciplines in a nine-weeks challenge-based learning course. The methods of data collection were: journals, individual interviews, and observations of team meetings. Results indicated that the students discussed and connected their disciplinary competences through organizing discussions during meetings and through working in mini-teams. Physics and engineering students' unique approaches to project planning and to problem solving were successfully incorporated during teamwork.

The study has implications for design and delivery of similar course contexts regarding improved communication across disciplines.

Using interaction dynamics to study intra- and inter-team processes of team learning
Keywords: Cooperative/Collaborative Learning, Lifelong Learning, Quantitative Methods, Resilience
Presenting Author: Lida Zoi David, University of Twente, Netherlands; **Co-Author:**Marcella Hoogeboom, University of Twente, Netherlands; **Co-Author:**Maaike Endedijk, University of Twente, Netherlands; **Co-Author:**Jan Maarten Schraagen, Netherlands Organisation for Applied Scientific Research (TNO), Netherlands

As team members interact, they learn to adjust their process and adapt to the demands of the situation over time. However, this collaborative learning in teams has been mostly studied through linear, static approaches to assess how teams learn. Such an approach fails to provide insight into the emergent nature of moment-by-moment changes in the team learning process. In this study, nonlinear, dynamic approaches will be applied to overcome this limitation, aiming to understand learning through team interaction dynamics. We recorded student teams training to perform cardiopulmonary resuscitation within the course of a two-month training period, and coded coordination behaviours (e.g. giving commands, requesting information) of each team throughout all training rounds, to investigate how the dynamics of interaction patterns formed from these behaviours emerge and change. Our analysis focuses on investigating intra- and inter-team differences in learning trajectory as reflected in interaction dynamics, and how it relates to team performance.

From decoration to documentantion: a collaborative action research at a Greek kindergarten.
Keywords: Cooperative/Collaborative Learning, Early Childhood Education, Learning Approaches, Teaching Approaches
Presenting Author: Alexandra Gkloumpou, Aristotle University of Thessaloniki, Greece; **Co-Author:**DOMNA KAKANA, Aristotle University of Thessaloniki, Greece

The culture of contemporary design is moving towards looking less at general rules and more at the relationships, creating a dynamic system that is flexible and adaptable. Reggio Emilia educators have long recognized the importance of the design and the use of the structured environment to the promotion of learning and they acknowledge the complex set of relationships that exist between the environment, the student and the teacher.At the Greek kindergarten the space and the decoration are considered and function in a stereotypical way. Also, collaborative learning is applied in a restricted and a perfunctory way. In our research program we intended to create a “relational space”, a space that gives priority to subject’s interactions and to the construction of knowledge through the pedagogical utilization of classroom’s decoration transforming it into documentation. We have chosen the ‘collaborative action research in education’ because we wanted to intervene on the agents of the educational environment so as to gain collaborative features that would lead to children’s active participation and learning. The first findings have shown that the pedagogical utilization of classroom’s decoration, created by the children, can function as a stimulus for exploration, expressions of emotions, views and experiences and acquisition of new knowledge. It provoked children’s imagination and created a positive psychological climate where all the children’s works were acceptable and were used as a resource of constructing new activities. It, also, functioned as documentation reinforcing teacher’s work.

The Importance of a Homogeneous Problem Perception for Successful Problem Regulation in CSCL
Keywords: Computer-supported Collaborative Learning, E-learning/ Online Learning, Higher Education, Self-regulated Learning and Behaviour
Presenting Author: Laura Spang, University of Augsburg, Germany; **Co-Author:**Martin Greisel, University of Augsburg, Germany; **Co-Author:**Ingo Kollar, University of Augsburg, Germany

Even though collaborative learning has repeatedly been shown to be an effective form of learning, students often fail to benefit from it. One reason for this might be that small group members may have different perceptions of what current problems make their learning difficult (e.g., low motivation of some learners; differences in their understanding of to-be-learnt concepts). Such heterogeneous problem perceptions may be difficult to sort out. A homogenous problem perception, in contrast, should help groups to regulate the problem collectively and effectively. Yet, these assumptions have hardly been investigated empirically in the past. Therefore, we had *N*=316 pre-service teachers collaborate online in small learning groups in a problem-based learning scenario on psychological development theories. After the learning session, we presented 33 problems to the participants and asked them to estimate the extent to which each problem appeared during their collaboration. We used the negative deviation of the individual problem ratings of each single group member from the rest of the group as a measure of homogeneous problem perception. As a second measure, we asked participants whether they believed that their problem perception differed from the problem perception of the rest of the group. As hypothesized, homogeneous problem perception was associated with different measures of subjective regulation success such as satisfaction, group coping and subjective knowledge acquisition. Support options to achieve a homogenous problem perception are discussed.

Session N 18

25 August 2023 14:45 - 16:15
AUTH_DC1
Single Paper
Learning and Social Interaction, Teaching and Teacher Education

Classroom Management

Keywords: Classroom Management, Communication Skills, Competencies, Critical Thinking, Eye Tracking, In-service Teachers, Mixed-method Research, Pre-service Teachers, Quantitative Methods, Social Aspects of Learning and Teaching, Social Interaction, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education, SIG 27 - Online Measures of Learning Processes
Chairperson: Emely Hoch, Leibniz-Institut für Wissensmedien, Germany

Teachers’ classroom management competences at their entry into the teaching profession
Keywords: Classroom Management, In-service Teachers, Pre-service Teachers, Teacher Professional Development
Presenting Author: Lena Hollenstein, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Christian Bruehwiler, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**MANUELA HALDIMANN, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Doreen Holtsch, University of Teacher Education St.Gallen, Switzerland

Studies have consistently shown that classroom management issues (e.g. dealing with disturbing behaviour) are one of the most challenging for teachers during the transition into the profession (Terhart, 1994; Zingg, & Grob, 2002). While pre-service teachers acquire a lot of knowledge about classroom management during their initial teacher training, they do not necessarily acquire classroom management skills (Jones, 2006; Stough et al., 2015). Situation-specific skills appear to be particularly significant in relation to classroom management (Jones, 2006). It can be assumed that classroom management competences build up and develop during the first years of teaching profession due to various formal and informal learning opportunities (König et al., 2017; Schmidt et al., 2011). However, research on the transition from pre-service teacher to in-service teacher is quite rare. In this paper, the development of classroom management competences will be examined during the first years of teaching. The following questions are investigated: 1. How do classroom management competences of in-service teachers develop during their first three years of teaching? 2. Which opportunities to learn (OTL) in classroom management during initial teacher education do in-service teachers perceive as particularly relevant for the development of their classroom management competences? 3. How are OTL related classroom management competences? The results will be discussed regarding the importance of OTL for the development of teachers’ classroom management skills during early career teaching. Furthermore, the insights will also be used to consider how to improve the measurement of teachers' professional competences for effective classroom management.

Preservice Teachers’ Lesson Planning Competence and Teaching Quality Regarding Classroom Management
Keywords: Classroom Management, Competencies, Pre-service Teachers, Quantitative Methods

Presenting Author: Madeleine Müller, University Erfurt, Germany; **Presenting Author:**Isabell Tucholka, TU Dortmund University, Germany

Effective classroom management is an essential dimension of teaching quality and requires preventive planning of according (re)actions and measures to ensure a positive learning environment without disruptions. While there has been some investigation regarding lesson planning competence, this research has not explicitly taken aspects of classroom management into account so far. In this study, we modelled classroom-management-specific lesson planning as a competence of preservice teachers because both lesson planning and classroom management are central topics of teacher education. Based on authentic planning documents of 105 preservice teachers, we investigated whether classroom-specific lesson planning competence could be modelled and reliably measured based on different criteria. Moreover, we examined how this competence relates to the preservice teachers' classroom management performance as perceived by themselves and their students (n = 1503) according to rating items.
The results revealed that preservice teachers' classroom-specific planning competence can be assessed reliably through authentic lesson plans: the interrater reliability of two coders regarding all coded criteria was sufficiently high and a confirmatory factor analysis confirmed a unidimensional competence model. Against our assumptions, however, correlation and regression analyses revealed no (predictive) connection between classroom-management-specific planning competence and the participants' perceived performance in class. Further investigation will have to show whether this competence is indeed not relevant for practical teaching or whether long-term implementation or increasing practical experience are necessary to unearth the potential relationship.

Professional Vision in the Classroom: Teachers' Knowledge-Based Reasoning and Visual Attention
Keywords: Classroom Management, Eye Tracking, Mixed-method Research, Teaching/Instructional Strategies
Presenting Author: Heli Muhonen, University of Jyväskylä, Finland; **Co-Author:**Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

As a concept, teachers' professional vision includes two main domains: *noticing* and *knowledge-based reasoning* (Seidel & Stürmer, 2014). Eye-tracking methodology has been increasingly utilized to study teachers' noticing in terms of their visual focus of attention, but there is a lack of mixed-method studies that have also considered the domain of knowledge-based reasoning. This study examined teachers' professional vision in terms of the extent to which teachers' knowledge-based reasoning explains their visual focus of attention to their whole class and individual students. A mixed-method study approach was utilized to investigate Grade 2 teachers' professional vision in an authentic classroom setting through eye-tracking methodology and retrospective think-aloud (RTA) interviews. In the RTA interviews, the teachers were given an opportunity to recall what they were thinking during their teaching in the recording and to explain the reasons for their actions. The findings showed that teachers' descriptions of students' social relations and emotions associated positively with teachers' visual focus of attention to the whole class. Teachers' descriptions of teacher-related information/elaboration and pedagogy linked negatively with teachers' visual focus of attention to individual students. The findings suggest that paying attention to the social relations and emotions of the class requires teachers to invest more attention among the whole class, while focusing on teaching and pedagogy-related aspects may allow less time for visual attention to the individual students.

Under Which Conditions Do Teachers Label Students as Having Behavior Problems?
Keywords: Classroom Management, Quantitative Methods, Social Aspects of Learning and Teaching, Social Interaction
Presenting Author: Boris Eckstein, University of Teacher Education Zurich, Switzerland; **Co-Author:**Urs W. Grob, University of Zurich, Switzerland; **Co-Author:**Kurt Reusser, University of Zurich, Switzerland; **Co-Author:**Alexander Wettstein, PHBern / University of Bern, Switzerland

Some students who display behaviors that deviate from classroom norms become labeled by their teacher as having "behavior problems". Previous research has not sufficiently clarified the extent to which such labels can be explained by the students' actual behavior, and to which extent they are due to other factors such as personality traits of the labeling teacher or contextual factors like the class composition. Adressing this research gap, the present paper explores the question: *Under which conditions do teachers label their students as having behavior problems?* 85 primary school teachers and their 1'412 students answered a survey. The teachers reported which students of their class have behavior problems according to their personal view (dependent variable). The students reported the frequency with which four randomly assigned classmates displayed undisciplined behaviors (first predictor). Furthermore, the teachers reported their general personal sensitivity to disturbances (second predictor). Using logistic regression analysis, the students' probability of becoming labeled by the teacher was estimated under the condition of their indiscipline frequency and the teachers' sensitivity. The results indicate that the teachers' labeling can be explained largely by the students' actual behavior – but not exclusively. The teachers' general sensitivity also has a significant impact, even when controlling for indiscipline. At the conference, these findings will be discussed reflecting the study's strength and limitations. Furthermore, upcoming analyses with additional predictors will be presented, e.g. focusing on classroom level effects.

How Language Shapes Our Views: A Study of Work with Language Awareness in a Year 7 Class
Keywords: Classroom Management, Communication Skills, Critical Thinking, Social Interaction
Presenting Author: Ingvill Rasmussen, University of Oslo, Norway; **Co-Author:**Kari Anne Rødnes, University of Oslo, Norway

In uncertain times, rhetoric about conflicts, parties and people often become pointed. Students encounter biased rhetoric in many channels; therefore, attending to language use is an essential part of education. This paper investigates how a teacher guides her year 7 class through a lesson addressing the topic of how language can express and shape our opinions of other people. The core data consists of video recordings and transcripts of the lesson. We take a dialogic, sociocultural approach, and our analytical procedures draw on socioculturally informed interaction analysis. Our findings show that the teacher provides tasks that allow students time and space to explore the topic of biased language use by discussing everyday words and utterances from public speeches and by creating their own speeches. The teacher firmly leads the class' work through her talk that repeatedly and explicitly addresses the lesson aim and ways of talking together in the classroom. She models respectful ways of talking, she reminds the students of attending to the utterances of others, and she regulates the work pace in the groups securing that they work together as a class. Through her explicit talk about language use and her distribution of talk between many participants, coherence is created between exploratory activities, ways of talking to learn and the subject-specific aim. This way of working with language promotes students' development of skills to relate critically to the utterances of others, as well as skills to use language to learn and collaborate with others.

Session N 19

25 August 2023 14:45 - 16:15
AUTH_TE2
Single Paper
Higher Education, Motivational, Social and Affective Processes

Feedback in Higher Education: Predictors and Outcomes

Keywords: Attitudes and Beliefs, Cooperative/Collaborative Learning, Educational Technologies, Emotion and Affect, Feedback, Goal Orientations, Higher Education, Motivation, Peer Interaction, Self-efficacy
Interest group: SIG 04 - Higher Education
Chairperson: Olga Chernikova, Ludwig Maximilian University, Germany

Do achievement goals and self-efficacy matter for students' perception and use of feedback?
Keywords: Feedback, Goal Orientations, Higher Education, Motivation
Presenting Author: Melanie V. Keller, University of Augsburg, Germany; **Co-Author:**Markus Dresel, University of Augsburg, Germany; **Co-Author:**Martin Daumiller, University of Augsburg, Germany

Feedback is considered as a key element for successful learning processes and can greatly impact achievement, but only if it is used adequately by its recipients. The question about which factors matter for how students perceive feedback, i.e., how they react to it in terms of emotions and perceived usefulness, and how they eventually use it, is important but still little understood. Investigating motivational antecedents of perception and use of feedback could contribute

to answering this question. From a theoretical perspective, students' achievement goals and self-efficacy should influence how they perceive and use feedback. To elucidate these connections, we conducted a longitudinal field study in a higher education course with 204 students who received tutor feedback on weekly assignments. We assessed (1) achievement goals for the assignment at the beginning of the semester and (2) self-efficacy for revision, achievement emotions, and attitudes towards the feedback together with the feedback, and (3) subjective and objective feedback use (via Jaccard-similarity). Self-efficacy, learning and appearance approach goals were associated with emotions and perceived helpfulness. Appearance goals and perceived helpfulness were associated with feedback use, all effects of goals, however, faded over time in later measurement points. These results illustrate that students' self-efficacy and achievement goals are important for how they perceive and implement feedback, emphasizing the theoretical notion that motivation is crucial in feedback processes. From a practical perspective, our results imply that fostering learning goals in students can improve their perception and implementation of tutor feedback.

The Effects of Free-Selection Peer Feedback Activities on Self-Efficacy of University Students
Keywords: Feedback, Higher Education, Peer Interaction, Self-efficacy
Presenting Author: Natasha Dmoshinskaia, University of Twente, Netherlands; **Co-Author:**Hannie Gijlers, University of Twente, Netherlands; **Co-Author:**Pantelis M. Papadopoulos, University of Twente, Netherlands; **Co-Author:**Alieke M. van Dijk, University of Twente, Netherlands

This study investigated how a free-selection, double-blind peer feedback activity affected the self-efficacy of bachelor's students. Specifically, 56 students of Psychology volunteered to participate in the study involving measuring their self-efficacy and completing course activities such as drafting an essay, reviewing peers' essays, and integrating peer feedback and own insights into the final essay. The study followed a hybrid free-selection approach according to which one peer's draft was assigned by the teacher, while the students were free to select and review *at least* one more draft from a pool of four that were randomly offered to them. Students' self-efficacy was recorded using the OPASS instrument before and after the peer feedback activity. Analysis of the OPASS scale and its three subscales (self-evaluation, receiving peer feedback, and reacting to peer feedback) showed a statistically significant improvement for two subscales (self-evaluation and reacting), and the whole scale, while a trend of improvement was recorded for the receiving subscale. Further analysis of the peer feedback metrics showed that the quality of the submitted reviews was a significant predictor for the receiving subscale, while the number of submitted reviews was a significant predictor for the whole scale. Even though the increase in self-efficacy did not affect the quality of the final essay, we argue that cognitive and more affective elements of peer feedback should be analysed in tandem to study the factors that influence translating feedback into one's performance.

Unpacking Emotional and cognitive responses to feedback in teams
Keywords: Cooperative/Collaborative Learning, Emotion and Affect, Feedback, Higher Education
Presenting Author: Catherine Gabelica, IESEG School of Management, France; **Co-Author:**Vitaliy Popov, University of Michigan, United States

Research on feedback in teams acknowledges the importance of feedback mechanisms to team success. However, although processing performance feedback in teams is seen as an important prerequisite to its effectiveness, the processes emerging after feedback reception have been overlooked in past research. This paper provides insights into the emotional and cognitive reflective responses of graduate students (N=111) to team-level feedback. The results of our explorative study reveal that (a) students from high-performing teams generally report positive activating emotions and generally reflect on feedback when prompted to do so, (b) many students from low performing teams were able to show adaptive emotional responses to team-level feedback, and (c) there is a complex interplay between feedback valence and affective and cognitive reactions to team feedback as evidenced and visualized by Epistemic Network Analysis model.

What changed my mind – Impact of feedback in online-self-assessments for study choice orientation
Keywords: Attitudes and Beliefs, Educational Technologies, Feedback, Higher Education
Presenting Author: Belinda Merkle, University of Mannheim, Germany; **Co-Author:**Hanna Buerkle, University of Mannheim, Germany; **Co-Author:**Karina Karst, University of Mannheim, Germany; **Co-Author:**Stefan Janke, University of Mannheim, Germany

Online self-assessments (OSAs) are supportive tools in the study choice process. After assessing prospective students' expectations regarding attractive fields of studies they provide feedback on prospective students' expectation discrepancies from study reality. Past research showed that higher expectation discrepancies in a particular field of study are related to larger changes in prospective students' cognitions about (choosing) the respective field of study. However, the significance of the feedback component has not been adequately investigated yet. Based on cognitive dissonance theory, we hypothesize that feedback moderates the relationship between expectation discrepancies and changes of cognitions about (choosing) the respective field of study. The positive relationship should be stronger when feedback is provided (vs. no feedback).
To test this research question, we used an experimental design in which 234 prospective students were randomly assigned to one of two groups (OSA with vs. without feedback) and assessed their cognitions before and after completing the OSA.
Multivariate hierarchical moderated regression analysis showed that higher absolute expectation discrepancies were related to larger absolute changes in values and expectancies for success. As hypothesized, we additionally found moderation effects of the feedback-condition. The positive associations between absolute expectation discrepancies and absolute changes in expectancies for success and study choice certainty were stronger when prospective students received feedback (vs. no feedback).
The findings suggest that both the development of effective feedback procedures and the selection of valid items adequately reflecting study contents and requirements are central to the intended effectiveness of OSAs in the context of study choice.

Session N 20

25 August 2023 14:45 - 16:15
AUTH_T202
Single Paper
Learning and Instructional Technology, Learning and Social Interaction, Teaching and Teacher Education

Educational Technologies in Vocational Education

Keywords: Anxiety and Stress, Attitudes and Beliefs, Competencies, Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Educational Neuroscience, Immersive Technologies for Learning, In-service Teachers, Quantitative Methods, Teacher Professional Development, Vocational Education and Apprenticeship Training
Interest group: SIG 14 - Learning and Professional Development, SIG 22 - Neuroscience and Education
Chairperson: Stephan Vogel, University of Graz, Austria

Technology use in vocational education: Teachers' competence and beliefs, and school-related factors
Keywords: Attitudes and Beliefs, Competencies, In-service Teachers, Teacher Professional Development
Presenting Author: Alberto Cattaneo, Swiss Federal University for Vocational Education and Training, Switzerland; **Co-Author:**Chiara Antonietti, Swiss Federal University for Vocational Eduation and Training (SFUVET), Switzerland

When studying technology integration in education, many models agree in attributing a prominent role to the teachers' beliefs, in particular their perceived usefulness (PU) of educational technologies and their self-efficacy beliefs on using technologies in their practice, which sometimes is measured recurring to teachers' self-assessed digital competence (TDC). However, most studies consider the teachers' intention to use technology, rather than their actual use and only few of them investigate variables at teacher and school levels in the same model. Finally, very few studies deal with vocational education (VET). The current study aims at exploring the role VET teachers' beliefs (in terms of PU and TDC) play on the use of technology in instructional practices (USE), adopting a multilevel approach applied to a self-reported questionnaire filled in by 1925 Swiss VET teachers. Results show that the variance in USE could be attributed more to difference within schools (44%) than to the difference between schools (5%), and that both TDC and PU have a significant and positive effect on USE. Additionally, when testing the direct and indirect effects of TDC on USE mediated by PU, both effects are significant (p

Stress-related psycho-physiological activation in emergency simulations using a 360° Video
Keywords: Anxiety and Stress, Educational Neuroscience, Immersive Technologies for Learning, Vocational Education and Apprenticeship Training
Presenting Author: Rita Cosoli, The Swiss Federal University for Vocational Education and Training (SFUVET), Switzerland; **Co-Author:**Francesca Amenduni, Swiss Federal University for Vocational Eduation and Training (SFUVET), Switzerland; **Co-Author:**Vito Candido, SFUVET, Switzerland; **Co-Author:**Alberto Cattaneo, Swiss Federal University for Vocational Education and Training, Switzerland

Emergency contexts are emotionally demanding, especially for novices. In this study, we aimed to compare a direct simulation condition in which the students simulate a road rescue in practice and an indirect simulation, in which the students observe a similar scenario through a 360° interactive video in immersive modality. The aim is to highlight whether psycho-physiological activation in a direct simulation is comparable to the one of an indirect simulation. The investigation was carried out by comparing psycho-physiological activation before and after the direct and the indirect simulations and using a multi-modal approach, which includes psycho-physiological measurements (Heart Rate and salivary cortisol sampling) and self-reported measurements. Preliminary results indicates that the psycho-physiological activation is higher before the direct simulation than after, probably due to the perceived relevance of the rescue task.

Fostering Virtual Teamwork – Shedding Light on Apprentices in VET using PLS-SEM
Keywords: Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Quantitative Methods, Vocational Education and Apprenticeship Training
Presenting Author: Frank Hiller, LMU Munich School of Management, Germany; **Presenting Author:**Stefanie Zarnow, LMU Munich, Germany

Not just since the Covid-19-pandemic, collaboration and cooperation among employees has changed significantly. When working from home, other ways of working together need to be applied to work across homes and borders. That is especially true for apprentices in VET: With both schools and companies closed during the pandemic and a ‘new normal’ in place, virtual teamwork (VTW) drastically gained in significance. A higher degree of VTW seems to be necessary to prepare apprentices for the labor market. However, there is little research on the current situation of apprentices regarding VTW. Therefore, we analyze a sample of N=207 German apprentices using Partial Least Squares Structural Equation Modelling (PLS-SEM) to examine interrelationships of Input-Process-Outcome variables with Satisfaction and Innovative Learning in virtual teams (VT) as desired targets of VET-activities. The results indicate that Organizational Factors have the most significant influence concerning the relationship between Input and Process factors. Surprisingly, Technical Affinity of individuals has only a minor influence. Regarding the relationship between Process and Outcome factors, Motivation & Responsibility have the highest impact on Innovative Learning whilst Communication Culture severely affects perceived Satisfaction in VTW. The findings lead to valuable insights on factors influencing VTW in apprenticeships and can help to design a learning program for apprentices’ preparation to new ways of collaboration and cooperation in their present and future working environment.

Session N 21

25 August 2023 14:45 - 16:15
UOM_R08
Single Paper
Assessment and Evaluation, Educational Policy and Systems, Lifelong Learning, Teaching and Teacher Education

School Leadership

Keywords: Assessment Methods, Classroom Assessment, Developmental Processes, In-service Teachers, Lifelong Learning, Pandemic, Qualitative Methods, School Effectiveness, School Leadership, Secondary Education, Teacher Professional Development, Well-being
Interest group: SIG 14 - Learning and Professional Development, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Leena Paakkari, University of Jyväskylä, Faculty of Sport and Health Sciences, Finland

Key factors of effective professionalisation programmes for school leaders
Keywords: Developmental Processes, Lifelong Learning, School Leadership, Teacher Professional Development
Presenting Author: Els Tanghe, University of Antwerp, Belgium; **Presenting Author:**Wouter Schelfhout, University of Antwerp, Belgium

Through educational leadership, the school leader contributes to school development, with an indirect impact on pupils’ learning. Attention to professional needs of school leaders in relation to required competences and a training programme that is oriented to development is opportune. This mixed-method research focuses on the perceived effects and underlying explanatory processes of school leaders' participation in a two-year innovative professionalisation programme aimed at combining key factors and approaches to effective professionalisation. First analyses show the impact of specific combinations of key factors and approaches on the school leaders’ learning process and on its transfer to specific actions in the school context.

Leading the School Change: Leadership Patterns and Implementation of Best Pedagogical Practices
Keywords: Assessment Methods, Classroom Assessment, School Effectiveness, School Leadership
Presenting Author: Irit Sasson, Tel-Hai College, Israel; **Co-Author:**Yael Grinshtain, Tel-Hai Academic College, Israel; **Co-Author:**Tamir Ayali, Tel-Hai Academic College, Israel; **Co-Author:**Itamar Yehuda, Tel Hai Academic College, Israel

In recent years there has been growing need to adopt pedagogical changes and design new learning environments. A sustainable school change is challenging to achieve and depends on a variety of factors. This study aimed to explore the factors that predict the application of best pedagogical practices by focusing on the relationship between distributed leadership, the level of assimilation of the pedagogical school vision, and the variables that moderate this relationship. A questionnaire was completed by 221 teachers from ten schools undergoing pedagogical change. A significant positive correlation was found between distributed leadership and the level of assimilation of the pedagogical school vision. Three sub-dimensions moderated this relationship significantly. Extensive application of formative assessment and inquiry learning by teachers strengthened the relationship; personal characteristics related to resistance to change demonstrated in short-term discomfort weakened it. The results contribute to an understanding of the process of leading a school change. The research demonstrates an important new methodological tool to assess the application of best pedagogical practices, which can contribute to research linking organizational, personal, and pedagogical characteristics in educational change.

Teachers’ and principals’ use of results from nationwide achievement tests: A mediation analysis
Keywords: In-service Teachers, School Effectiveness, School Leadership, Secondary Education
Presenting Author: Patrick Hawlitschek, Institute for Educational Quality Improvement (IQB), Germany; **Co-Author:**Sofie Henschel, Institute for Educational Quality Improvement (IQB), Germany; **Co-Author:**Dirk Richter, University of Potsdam, Germany; **Co-Author:**Petra Stanat, Institute for Educational Quality Improvement (IQB), Germany

In many countries, educational policy increasingly expects teachers to use results from nationwide achievement tests for data-based decision-making. Theoretical models suggest that teachers’ data use for instruction are not only related to their attitudes and the organizational culture of data use in their schools but also to the use of data by their school principals. However, the relationship between teachers’ and principals’ data use has rarely been tested in quantitative analyses and existing studies only provide limited evidence. In addition, there is some evidence that teacher attitudes and the culture of data use in school serve as mediators. This study therefore examined these relationships using data from two large-scale samples ($N_{mathematics\ teachers}$ = 796 and $N_{German\ teachers}$ = 693), with self-reports from teachers and principals. Results of structural equation models show that data use by secondary school teachers is significantly associated with data use by principals. Moreover, teacher-perceived culture of data use fully mediates this relationship, but teacher attitudes do not. We were able to replicate our results for two large-scale samples, providing evidence for the generalizability of our findings. This study points to the importance of principals shaping a school’s data use culture beyond individual teacher attitudes. Thus, supporting principals to develop a positive data use culture to improve educational quality seems promising for future professional development.

Emotional intelligence as game changer in school leadership: Notes from the Covid-19 pandemic.
Keywords: Pandemic, Qualitative Methods, School Leadership, Well-being
Presenting Author: Stella Jackman-Ryan, North Carolina State University, United States; **Co-Author:**Lisa Bass, North Carolina State University, United States; **Co-Author:**Mario Jackson, North Carolina State University, United States

The COVID-19 pandemic prompted rapid disruptions and spontaneous shifts in education. In the interest of public health, and in adherence to CDC guidelines, school leaders across the United States and the rest of the world made strategic decisions to close schools or transition to remote learning during that time. These decisions presented a critical repositioning of school principals' work and they were challenged to rely on additional socioemotional skills to navigate the experience. Emotional intelligence is well documented in the literature as a key predictor of leadership effectiveness. To this end, we conducted a multiple case study to learn about how principals with varying strengths in emotional intelligence leveraged their leadership skills during the pandemic. Our sample was selected from a larger sample of principals who participated in a study on school leadership in a southeastern state in the United States. In that study, principals were required to complete an emotional intelligence instrument among other surveys. Our sample consists of a total of 10 principals —five principals who scored the highest, and 5 principals who scored the lowest on the emotional intelligence measure. Data was collected via semi-structured interviews and we utilized Goleman's emotional intelligence model to frame our analysis of the principals' leadership. Four coders analyzed the interviews through a series of open coding followed by axial coding. Preliminary findings suggest that principals with higher self-ratings on emotional intelligence were more attuned to their teachers' needs, and prioritized relationship management during the pandemic.

Session N 22

25 August 2023 14:45 - 16:15
UOM_A07
Single Paper
Motivational, Social and Affective Processes, Teaching and Teacher Education

Pre-service Teachers' Motivational Beliefs

Keywords: Attitudes and Beliefs, Competencies, Mindsets, Motivation, Pre-service Teachers, Primary Education, Science Education, Secondary Education, Self-determination, Teaching/Instructional Strategies, Well-being
Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education
Chairperson: Charles Selorm Dzormeku, University of Turku, Finland

Brilliance Beliefs of German Pre-Service Teachers: A longitudinal analysis
Keywords: Attitudes and Beliefs, Mindsets, Motivation, Pre-service Teachers
Presenting Author: Katharina Asbury, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**Bastian Carstensen, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**Uta Dr. Klusmann, Leibniz Institute for Science and Mathematics Education (IPN), Germany

Teacher mindsets about students' capabilities have been shown to be relevant for students' motivation and achievement. However, research on structure and correlates of teacher mindsets with aspects of teachers' professional competence is still in its infancy. Most findings on teacher mindsets and their correlates are merely cross-sectional. The present study sought to address these issues by examining pre-service teachers' fixed mindsets about intelligence as well as field-specific mindsets, so called *brilliance beliefs*. The brilliance belief construct is a conceptual extension of the classical mindset construct, adding the aspect of subject specificity. We investigated longitudinal data of $N = 326$ German pre-service to answer questions about (1) the stability of brilliance beliefs over two years; (2) differential changes between STEM- and non-STEM students; and (3) associations between fixed mindsets and brilliance beliefs with aspects of professional competence. We found brilliance beliefs in pre-service teachers to be stable over a two-year period. Like prior research (e.g. Leslie et al., 2015, Deiglmayr et al. 2019) we found differences in pre-service teachers' brilliance beliefs relating to their subject areas. Students with STEM subjects (science, technology, engineering, mathematics) had stronger brilliance beliefs than students in other subjects. Moreover, in line with prior research in this field, fixed mindset was negatively related to important motivational factors of teachers, enthusiasm and pedagogical interest. Brilliance belief was found to be a negative predictor for enthusiasm, but not for pedagogical interest. Results indicate a construct stability of brilliance beliefs as well as a STEM/Non-STEM divide.

Finnish pre-service science and primary teachers' motivations and perceptions of teaching
Keywords: Motivation, Pre-service Teachers, Primary Education, Science Education
Presenting Author: Antti Lehtinen, University of Jyvaskyla, Finland; **Co-Author:**Tomi Jaakkola, Tampere University, Finland; **Co-Author:**Koen Veermans, University of Turku, Finland

In Finland, primary teacher education is very popular, but science teacher education is not. Finland might face a shortage of science teachers in the future. The aim of this study is to analyze Finnish pre-service primary and subject teachers' motivation to become a teacher and their perceptions of teaching as and whether there are differences between the two teacher education tracks.The FIT-Choice scale was used for data collection. It is an internationally validated scale aimed at measuring pre-service teachers' motivations to become a teacher and perceptions of teaching. Data came from 169 pre-service primary teachers' and 46 pre-service science (physics or chemistry) teachers.Common motivational factors were intrinsic value of teaching and perceived teaching abilities. Altruistic factors such as shaping the future of children were significantly stronger motivators for primary pre-service teachers than science teachers. Prior teaching and learning experiences were significantly stronger motivators for science pre-service teachers than primary teachers. The common perception of teaching was that it is a demanding expert career. The science pre-service teachers perceived significantly more that their salary would be comparatively good. As a conclusion, recruitment for science teacher students should emphasize the enjoyment one gets from teaching, the importance of one's own perception of their teaching abilities and the good prior teaching and learning experiences one has had as these are the strongest motivators for current pre-service science teachers.

Basic Needs Satisfaction During a Teaching Practicum: An Intraindividual Perspective
Keywords: Competencies, Motivation, Pre-service Teachers, Self-determination
Presenting Author: Mathias Dehne, Friedrich Schiller University Jena, Germany; **Co-Author:**Miriam Jähne, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Susi Klaß, Friedrich Schiller University Jena, Germany; **Co-Author:**Alexander Groeschner, Friedrich Schiller University Jena, Germany

Learning in a teaching practicum is highly intraindividual. However, to date, this dynamic process has been investigated mainly through trait-like, interindividual (between-person) statistics. In contrast, a state-like, intraindividual (within-person) perspective, for instance, regarding motivation, has rarely been applied. This study aimed to disentangle the basic needs of 115 preservice teachers into their trait-like, interindividual and state-like, intraindividual proportions using biweekly measurement occasions. This analytical approach allowed us to relate preservice teachers' situational basic needs satisfaction to specific learning occasions in the practicum. Applying random intercept cross-lagged panel models, we found generally few carry-over effects from measurement occasion to measurement occasion. Furthermore, negative cross-lagged interrelations between competence and autonomy, as well as competence and relatedness, were found at the beginning of the teaching practicum. The presentation will discuss the implications of this intraindividual analytical perspective for the field of teaching and teacher education.

Predicting student's basic needs through motivational appeals: Outcomes on grit and well-being
Keywords: Secondary Education, Self-determination, Teaching/Instructional Strategies, Well-being
Presenting Author: Elisa Santana Monagas, University of Las Palmas de Gran Canaria, Spain; **Co-Author:**Juan L. Núñez, University of Las Palmas de Gran Canaria - Faculty of Educational Sciences, Spain; **Co-Author:**Jaime León, Universidad de Las Palmas de Gran Canaria, Spain

Following a prospective design, the present study aimed to analyse the predictive value teachers' motivational appeals (i.e., the messages that appeal to a

specific motivation) have on students' basic psychological need profiles. We also examine how these profiles predict students' outcomes on grit and well-being. The sample of the study was comprised of a total of 655 secondary students. To estimate students' profiles a person-centered approach was followed revealing four different profiles: thwarted, fulfilled, low fulfilment and neutral profiles. Teachers' that relied on autonomous motivational appeals were more likely to have students that belonged to the more adaptive profiles, whereas teachers who relied on amotivational appeals had students who were more likely to belong to the non-adaptive profiles. Finally, students whose basic need profiles where more adaptive reported higher levels of both grith and well-being. Thus, the present findings emphasize a new resource teachers can rely on to promote students' needs, well-being, and grit experiences.

Session N 23

25 August 2023 14:45 - 16:15
AUTH_T102
Single Paper
Assessment and Evaluation, Cognitive Science, Teaching and Teacher Education

Reading and Writing in a Foreign Language

Keywords: Cognitive Skills and Processes, Feedback, Foreign and Second Language Acquisition, Higher Education, Learning Approaches, Meta-analysis, Migrant / Refugee and Minority students, Motivation, Quantitative Methods, Reading, Self-efficacy, Writing/Literacy
Interest group: SIG 12 - Writing, SIG 17 - Methods in Learning Research, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Christian Waldmann, Linnaeus University, Sweden

The relationship between reading, spelling, writing fluency, and text quality
Keywords: Cognitive Skills and Processes, Foreign and Second Language Acquisition, Reading, Writing/Literacy
Presenting Author: Eva Lindgren, Umeå University, Sweden; **Co-Author:**Christian Waldmann, Linnaeus University, Sweden; **Co-Author:**Maria Levlin, Umeå University, Sweden

This study explores (1) how reading and spelling relate to writing fluency, and (2) how reading, spelling and writing fluency relate to text quality. One hundred and thirty Swedish upper secondary school students performed 2 reading tasks (word recognition, reading comprehension) and a spelling dictation task, and wrote one text per language (L1 Swedish/FL English) and genre (narrative/argumentative), in total 4 texts, using keystroke logging. Measures of product (number of characters in final texts, total number of typed characters) and process (number of characters per minute, length of bursts between pauses and revisions) fluency were extracted from the keystroke logs, and the final texts were scored for text quality based on seven dimensions: content, organisation, cohesion, vocabulary, language use, spelling, and punctuation. The data was analysed statistically using ANOVA and regression models. Results showed that reading comprehension and spelling related to both product and process fluency, and that word recognition, reading comprehension, spelling and writing fluence were related to text quality. However, language and genre influence the relationships and created differences between L1 and FL writing as well as between narrative and argumentative texts. The results raise questions about the relationship between reading and writing and how reading seems to be applied differently during writing depending on what language and genre is used.

How can feedback improve L1, L2, and FL learners' writing? A systematic review
Keywords: Feedback, Foreign and Second Language Acquisition, Meta-analysis, Writing/Literacy
Presenting Author: Sina Scherer, Westfälische Wilhelms-Universität Münster, Germany; **Co-Author:**Steve Graham, Arizona State University, United States; **Co-Author:**Vera Busse, Westfälische Wilhelms-Universität Münster, Germany

Writing is a key competence crucial for academic and professional success, but many adolescent students struggle with writing and need better support (see Graham & Perin, 2007), particularly foreign language (FL) and second language (L2) learners (e.g. Authors, in press; Hyland, 2003; Silva, 1993). To improve students' writing, feedback can play an important role (e.g. Biber et al., 2011). Yet, it is unclear to date which kind of feedback works best for different language learners. Thus, our project's aim is to conduct a meta-analysis investigating whether feedback is differentially effective for different language learners, namely L1 (first language), L2, and FL learners. In this paper, we present results from our systematic literature search. We identified 948 studies of which 126 studies could be included after coding (L1 n = 29 studies; L2n = 15; FL n = 82). Results suggest that different learners have different feedback needs, particularly regarding direct and indirect corrective feedback. Most studies investigate teacher corrective feedback in the FL context and show conflicting findings, while corrective peer feedback shows positive results for FL learners. Studies on non-corrective peer feedback in the L2 context and studies on computer-based corrective teacher and computer-based corrective peer feedback in the L2 context are scarce. We outline further steps in data analysis and discuss implications for practice and future research.

EFL/ESL Teachers' and Students' Perceptions and Practices of Written Feedback: A Systematic Review
Keywords: Feedback, Foreign and Second Language Acquisition, Higher Education, Writing/Literacy
Presenting Author: Abderrahim Mamad, University of Szeged, Doctoral School of Education, Hungary; **Co-Author:**Tibor Vígh, University of Szeged, Hungary

Unlike previous studies that focused extensively on the controversial issues of the effectiveness of written corrective feedback, the impact of teacher feedback on students' perceptions in writing, the student's response to written feedback (WF), and its role in improving student learning, this systematic review aims not only to identify based on which aspects EFL, ESL, and academic writing teachers' and students' perceptions and practices of WF are examined but also to determine the relationship between these teachers' and/or students' perceptions and their practices. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol was used. Electronic searches were performed across Scopus and EBSCOhost, which produced a total of 2398 articles. Two researchers retrieved, screened, and assessed these articles (published after 1996) for eligibility. The results were synthesized using a descriptive analysis of 32 articles that met the inclusion criteria. Most studies focused on students' perceptions of WF more than those of teachers. Whereas few studies concentrated on teachers' and students' reported practices of WF, little research explored the relationship between teachers' perceptions and their reported practices. The comparison also between teachers and students regarding their perceptions of WF was limited, but regarding their practices, no study was derived from the thematic analysis of the systematic review. Therefore, this systematic review fills a gap in feedback research, especially concerning teachers' and students' practices as well as regarding a series of comparisons either between teachers and students or between their perceptions and practices of WF.

Investigating the Effects of Linguistic Distance on German and English Reading and Mathematics
Keywords: Foreign and Second Language Acquisition, Migrant / Refugee and Minority students, Quantitative Methods, Writing/Literacy
Presenting Author: Daria Ferencik-Lehmkuhl, University of Cologne, Germany; **Co-Author:**Nils Jaekel, University of Oulu, Finland; **Co-Author:**Michael Schurig, Technical University Dortmund, Germany; **Co-Author:**Sandra Schwinning, University of Wuppertal, Germany

Multilingual classrooms are becoming more common around the globe following increased migration and mobility. Multilingual learners often have to overcome potential language barriers across the curriculum as the majority language remains the point of reference for learners across subjects. Analytically, multilingualism is often mapped in terms of categories (L1/L2), but a measure of linguistic distance can provide additional information for teaching practice. Little research has considered the impact of linguistic distances from students' L1s to the language of instruction and foreign languages, particularly in immigrant language contexts, in contrast to categorical L1 operationalizations.This study investigates how linguistic distances affect native speakers' and multilingual learners' (N=3,307) attainment of German reading (L1/L2), English reading (L2/L3), and Mathematics in grade 5. We used mixed-effects modeling to examine the role of linguistic distance while rigorously controlling for individual learner characteristics focused on language and students' socioeconomic status. The characteristics controlled for include sex, multilingual status, birth abroad, cultural capital, having one's own room and own computer, as well as household income.Results suggest that cognate linguistic distance is a significant factor in predicting German and English reading scores as well as Mathematics achievement. This could deepen the simplistic understanding of linguistic effects through binary categories. Pedagogical implications and considerations to bridge linguistics distance are discussed.

Non-native pupil motivation in spoken English: learning English with an embodied phonology method
Keywords: Foreign and Second Language Acquisition, Learning Approaches, Motivation, Self-efficacy
Presenting Author:NATHALIE HUET, University of Toulouse 2, France; **Co-Author:**Marie-Héléna Hana Younan, University of Toulouse, France; **Co-Author:**Julie Rouaud, University of Paris-Sorbonne Nouvelle, PRISMES-SeSyliA, France; **Co-Author:**Victoria O'Callaghan, University of Toulouse 2, CLLE-UMR 5263 CNRS, France; **Co-Author:**Anne Przewozny, University of Toulouse 2, CLLE UMR 5263 CNRS, France

In order to improve French secondary school pupils' English pronunciation, a method in learning English phonology that builds on both segmental and suprasegmental production and perception, was developed in line with an embodied cognition framework. In reference to Barsalou (2008), knowledge is embodied because it stems from bodily states resulting from the activity of sensory-motor and emotional neural systems. When applied to articulatory phonetics, the embodied approach aims to make learners aware that segmental production implies a vibratory act and an articulatory process, i.e., a bodily gesture associated with a speech act. The main aim of this study is to assess the efficiency of an embodied method (congruent gesture associated to the pronunciation of the word) on phonetic performance and to test the effect of the method on personal self-efficacy and anxiety on phonetic performance related to six groups of words. A third goal is to verify the evolution of self-efficacy and anxiety after practicing spoken English with such an embodied method. Participants were 13-year-old French pupils. Half of them benefited from the embodied method and the others were in the control group (without gesture) during three weeks. Results show that pupils in the embodied group outperformed those in the control group only on two sets of words. Moreover, self-efficacy and anxiety in English pronunciation do not differ according to the method and they remain stable. Results are discussed in terms of the congruence of the gesture associated to specific phonemes and the length of the learning phase.

Session N 24

25 August 2023 14:45 - 16:15
UOM_R02
Poster Presentation
Instructional Design, Learning and Instructional Technology, Teaching and Teacher Education

Writing and Literacy Development

Keywords: Artificial Intelligence, Cognitive Development, Cognitive Skills and Processes, Communication Skills, Competencies, Comprehension of Text and Graphics, E-learning/ Online Learning, Inquiry Learning, Instructional Design, Quantitative Methods, Reasoning, Secondary Education, Self-regulated Learning and Behaviour, Sustainable Development, Teacher Professional Development, Writing/Literacy
Interest group: SIG 12 - Writing, SIG 14 - Learning and Professional Development, SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Jarkko Hautala, Niilo Mäki Institute, Finland

The Contributions of Executive Functioning to Handwritten and Keyboarded Compositions in Year 2
Keywords: Cognitive Development, Cognitive Skills and Processes, Self-regulated Learning and Behaviour, Writing/Literacy
Presenting Author: Deborah Pino-Pasternak, University of Canberra, Australia; **Co-Author:**Debora Valcan, Murdoch University, Australia; **Co-Author:**Anabela Malpique, Edith Cowan University, Australia; **Co-Author:**Timothy Teo, The Chinese University of Hong Kong, Hong Kong; **Co-Author:**Mustafa Asil, University of Otago, New Zealand

Writing is a highly complex skill, recruiting a range of cognitive processes that involve working memory, attention shifting and inhibition, also known as executive functioning (EF). Despite emerging research examining associations between EF and handwritten composition, the mediating role of transcription skills such as automaticity and spelling on the relation between EF and text composition remains underexplored. Even less is understood about the nature of these potential mediation mechanisms in keyboarding, a writing modality that is becoming pervasive in the early years of schooling. The present study examined whether transcription skills mediate the relation between children's EF and text composition across two modes (handwriting and keyboarding) on a sample of 544 Year 2 Australian children. Assessments of EF, transcription skills and text composition were measured concurrently. Indirect pathways were tested via structural equation modelling. Findings indicated that across text composition modes, transcription skills (i.e., automaticity and spelling) mediated the relationship between children's EF and writing composition (i.e., compositional fluency and compositional quality). The findings of this study extend current understanding of associations between cognitive processes and text composition in the junior years of schooling and innovate by examining whether hypothesised associations between EF and writing can be extrapolated to keyboard-based writing.

Identifying Negative Language Transfer in the English Writing of Chinese and Farsi Native Speakers
Keywords: Artificial Intelligence, Communication Skills, Comprehension of Text and Graphics, Writing/Literacy
Presenting Author: Maria Cutumisu, University of Alberta, Canada; **Co-Author:**Mohammad Karimiabdolmaleki, University of Alberta, Canada; **Co-Author:**Leticia Farias Wanderley, University of Alberta, Canada; **Co-Author:**Carrie Demmans Epp, University of Alberta, Canada

Effective communication in English can facilitate educational and employment opportunities for learners of English as an additional language (EAL) who tend to employ rules from their native language while communicating in English. This results in negative language transfer (NLT) when the rules from the native language do not match those of English. One way to assist EAL learners is to identify NLT errors in their English writing. However, manually identifying NLT is a difficult task that requires time and expertise. A model that automatically identifies NLT in learner writing could help learners in the absence of other supports. In this study, four classification algorithms were implemented to automatically identify NLT errors in EAL learner writing. Two of the language modeling approaches employed, n-gram and RNN, are grounded in the linguistic nature of NLT, whereas the other two are general-purpose classifiers: random forest and logistic regression. The findings revealed that the developed models could identify NLT in the English writing of Chinese and Farsi native speakers. Random forest obtained superior results with average weighted F1-scores of 78.1% on the Chinese First Certificate in English (FCE) dataset and 94.8% on the Farsi Lang-8 dataset. This work shows that the implemented models can be used to identify NLT automatically for two languages that use different writing systems (logographic and alphabetic).

Modelling writing competence
Keywords: Competencies, Quantitative Methods, Secondary Education, Writing/Literacy
Presenting Author: Rebecca Kreutz, Universität zu Köln/ University of Cologne, Germany; **Presenting Author:**Julie Philippek, Universität zu Köln/ University of Cologne, Germany; **Co-Author:**Ann-Kathrin Hennes, University of Cologne, Germany; **Co-Author:**Barbara Schmidt, University of Cologne, Germany; **Co-Author:**Alfred Schabmann, University of Cologne, Germany

Deficits in writing competence can lead to problems in school and social participation, which is why it is important to support children as early as possible (Hennes et al., 2018). To ensure adequate support, a profound understanding of the subskills of writing competence is essential. Empirical writing theories have already helped us better understand the contribution of different subskills to writing competence (Berninger & Amtmann, 2003; Berninger & Winn, 2006). However, empirical work is often limited to low-level transcription skills like spelling and handwriting fluency and cognitive components like executive functions. In addition to these, higher-level subskills that produce coherence in texts, such as word competence, syntactic competence and generating coherence, are also relevant, albeit only weakly defined theoretically (Becker-Mrotzek et al., 2014; Gómez Vera et al., 2016). In the current study, we established a model that brings together low- and high-level subskills. We tested executive functioning, handwriting fluency and spelling as low-level subskills and lexical diversity, word and sentence usage, local cohesion and tense correctness as high-level subskills. In addition, students had to write a narrative text, which was used to determine writing competence. The results showed that cognitive components and low-level subskills had primarily indirect effects on writing competence mediated by high-level subskills. Furthermore, the high-level subskills accounted for most of the explained variance in writing competence. Therefore, writing interventions should focus on high-level subskills in addition to low-level subskills.

Benefits of Image Interpretation Models on Adolescents' Historical Reasoning
Keywords: Inquiry Learning, Instructional Design, Reasoning, Writing/Literacy
Presenting Author: Kevin van Loon, University of Applied Sciences Northwestern Switzerland FHNW School of Education, Switzerland; **Co-Author:**Monika Waldis, University of Applied Sciences Northwestern Switzerland, Switzerland

This study investigated adolescents' (secondary school students, *N* = 145, *M* age 13.9 years) historical reasoning when learning with images with the support of different instructional scaffolds. Past research on students' historical reasoning showed that methodological skills are lacking. Image interpretation models, and visual representations (mind mapping) may support students with historical reasoning. However, benefits of such instructional scaffolds are unclear. The present research investigated whether there are differences between two image interpretation models and mind mapping on students' historical reasoning, as assessed with text writing performance. Participants interpreted 3 photographs over three measurement points (one image per measurement point). At measurement point one, students had no instructional scaffold. At measurement point two, the 3 types of scaffolds were introduced (RCT). These were a mind map scaffold, a linear image interpretation scaffold, and a dynamic image interpretation scaffold. At measurement point 3, they again interpreted an image with the assigned scaffold. Student texts were rated with the qualitative content analysis to assess historical reasoning competencies. Results showed that learning with image interpretation models support students historical reasoning better than mind mapping. Further, both interpretation models, the linear and the dynamic, seem to enhance students' historical reasoning. Especially the dynamic model showed promising effects for contextualization and the description of the relevance of the image message for the present. However, this effect was not stable over time. Further research is needed to investigate whether a certain interpretation model is more adequate when learning with a specific type of image.

The promotion of writing strategies and the evaluation of the implementation process
Keywords: E-learning/ Online Learning, Sustainable Development, Teacher Professional Development, Writing/Literacy
Presenting Author: Seda Yilmaz Wörfel, TU Chemnitz, Germany; **Co-Author:**Simone Jambor-Fahlen, University of Cologne, Mercator Institute for Literacy and Language Education, Germany; **Co-Author:**Nora Fröhlich, Institute for Educational Analysis (IBBW), Germany; **Co-Author:**Benjamin Fauth, Institute for Educational Analysis (IBBW), Germany; **Co-Author:**Alexandra Dehmel, Institute for Educational Analysis (IBBW), Germany; **Co-Author:**Michael Becker-Mrotzek, University of Cologne, Mercator Institute for Literacy and Language Education, Germany

Good writing skills are not only necessary for success in school, but also for participation in society. The project "Die Textprofis" aims to promote the basal reading and writing skills (in four fields: reading fluency, reading strategies, writing fluency and writing strategies) of fifth graders at non-academic track secondary schools in Baden -Württemberg.
In this paper, part of the training concept with focus on the promotion of writing strategies and the evaluation of the implementation process will be presented. The overarching research question is:
Which are the main influencing factors when successfully implementing a science-based writing strategies training in practice? The study has a quasi-experimental design. The data consists of N = 901 students at 48 schools, N = 48 principals, N = 106 teachers, N = 17 expert advisors for instructional development and N = 15 advisors for school development.
In this paper, we operationalize the successful implementation a) via the implementation fidelity in terms of e.g., the frequency and the duration of the training units and b) via the perceived acceptance and cost-benefit ratio of the training. As influencing factors we will examine e.g., the teachers' motivation to promote students' writing skills, the perceived usefulness of the teacher training, the perceived transferability of the training's contents and the usefulness of the support by the expert advisors. Overall, the study contributes to implementation and transfer research, especially with regard to the implementation of evidence-based writing strategy training and gives valuable insights into teacher training during the pandemic.

Session N 25

25 August 2023 14:45 - 16:15
UOM_R03
Poster Presentation
Assessment and Evaluation, Higher Education, Learning and Social Interaction

(Self-)Assessment Methods

Keywords: Assessment Methods, At-risk Students, Classroom Assessment, Cognitive Skills and Processes, Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Creativity/Divergent Thinking, Higher Education, Instructional Design, Learning Analytics, Metacognition, Problem Solving, Qualitative Methods, Reasoning
Interest group: SIG 04 - Higher Education, SIG 16 - Metacognition and Self-Regulated Learning, SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Ioannis Dimakos, University of Patras, Greece

Standardization of Metacognition in Creative Problem-Solving (MCPS) Scale
Keywords: Assessment Methods, Creativity/Divergent Thinking, Metacognition, Problem Solving
Presenting Author: Kamila Urban, Institute for Research in Social Communication, Slovak Academy of Sciences, Slovakia; **Co-Author:**Marek Urban, Institute of Psychology of Czech Academy of Sciences, Czech Republic

Metacognition plays an important role in various activities; yet, it is traditionally studied in well-defined tasks such as memory, comprehension, or reasoning. However, metacognition significantly affects the problem solving of ill-defined tasks. An efficient creative problem-solver can transfer previous knowledge to novel and unusual situations. For successful creative problem-solving, a student needs to plan, monitor and regulate the process and evaluate the originality and usefulness of the outcome. The goal of the present study was to standardize the scale for metacognition in problem-solving (MCPS). A representative sample of 350 Czech university students of social sciences and humanities filled the Metacognitive Self-Regulation Scale from MSLQ and the MCPS scale, performed a product improvement task and self-evaluated the level of creativity of their own solutions. The MCPS scale yielded an excellent internal consistency calculated by CFA and IRT modeling. Moreover, MCPS demonstrated adequate convergent and divergent construct validity predicting both creativity and the accuracy of metacognitive monitoring. Therefore, MCPS is an adequate self-reported scale for assessing metacognition in creative problem-solving in the school context.

Teaching Analysis Poll (TAP) in SQUARE: Insights into a Joint Practice and Research Project
Keywords: Assessment Methods, Higher Education, Instructional Design, Qualitative Methods
Presenting Author: Stefan T. Siegel, University of St.Gallen, Switzerland

Since 2016, the Quality Development Services (QD) and the Centre for Learning and Teaching in Higher Education at the University of St.Gallen (IWP) have been offering Teaching Analysis Polls (TAPs) to instructors on a voluntary basis. TAPs are a participatory, formative feedback method with which university instructors can obtain qualitative feedback on their courses during the semester. SQUARE was ceremonially opened in 2022. Designed by the Japanese architect Sou Fujimoto, the building is intended to be an experimental field for teaching and learning, which enables interaction between students, university faculty, business and industry professionals, and local residents. At the request of SQUARE, specialized TAPs were developed and conducted in the spring semester 2022 to gain insights into teaching and learning within SQUARE. This poster will present insights from a joint practice and research project.

Talking Transactivity: Various Perspectives and a Possible Direction for Automated Analysis
Keywords: Assessment Methods, Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Reasoning
Presenting Author: David Otten, University of Twente, Netherlands; **Co-Author:**Pantelis Papadopoulos, University of Twente, Netherlands; **Co-Author:**Maaike Endedijk, University of Twente, Netherlands

Transactivity, or building upon a previous contribution of a learning partner, is important for the co-construction of knowledge during collaborative learning. This presentation presents various definitions and facets of transactivity. Our future goal is to provide tools for automated analysis and feedback on transactivity

within collaborative learning. We aim to answer the following question: *What are different perspectives on transactivity and what perspective can contribute to the development of automated tools for feedback on transactivity*? Some definitions of transactivity, such as solely (dis-)agreeing with a learning partner's contribution, or a simple paraphrase, do not necessarily assess the co-construction of knowledge. In the context of collaborative learning, a tool for automated analysis should ideally also take this factor into account. Based on existing definitions synthesized with recent research, we argue that a linguistic perspective on transactivity is needed to achieve our future goal. The poster provides an overview of coded examples using different perspectives on transactivity. It conclusively presents a model which can be applied when a more linguistic-level approach to transactivity is desirable.

Using students' interaction with self-assessments during the semester for predicting course success
Keywords: Assessment Methods, At-risk Students, Higher Education, Learning Analytics
Presenting Author: Clara Schumacher, Humboldt Universität zu Berlin, Germany; **Co-Author:**Dirk Ifenthaler, University of Mannheim, Germany; **Co-Author:**Jakub Kuzilek, Humboldt Universität zu Berlin, Germany

Using self-assessments to test understanding and progress of learning is considered beneficiary for learning outcomes. However, in higher education offering self-assessments and feedback is predominantly restricted due to resource constraints. Using digital learning environments facilitates the provision of self-assessments and feedback. Furthermore, this allows tracking learners' interaction with the self-assessments. This field study investigates students' interaction with self-assessments over the entire course period and if this could be used for predicting students' success in the course. Findings indicate that students do not allocate the self-assessments over the semester but use them directly before the exam dates. If students do not use the self-assessments, their probability of failing the course is about 32.7%. Hence, students need to be made aware of the benefits of self-assessments and fostered using them. Future research should investigate other disciplines and relate findings from trace data with variables not trackable in the digital learning environment.

Analysis of Creativity in Collaborative Writing Texts Using the T-CREANT Assessment Tool
Keywords: Classroom Assessment, Cognitive Skills and Processes, Creativity/Divergent Thinking, Qualitative Methods
Presenting Author: Noemí Font-Piqué, University of Lleida, Spain; **Co-Author:**Manoli Pifarré Turmo, University of Lleida, Spain

This papers reports the validation and use of a tool to assess the four dimensions of creativity in collaborative writing: flexibility, fluency, elaboration and originality. The tool is called T_CREANT (Tool for evaluating creativity in narrative texts) and it is used to evaluate narrative texts written by high school students who have participated in a writing project-based learning. The research methodology is a case study. 27 secondary school students participated in the study, organized in groups of 4-5 students. The T_CREANT tool allows the collection of quantitative data, such as: number of paragraphs, ideas, different ideas, elaborated paragraphs, original paragraphs, metaphors,; and qualitative data (type of elaborated narrative element, original linguistic, elaborated per paragraph and type of original element per paragraph). Three statistical data analysis have been used: descriptive statistics methods; visualization of the data in graphs and figures and correlation between the dimensions of flexibility-fluency and elaboration-originality. Results show that T_CREANT can assess the four dimensions of creativity within the framework of collaborative writing activity. Each of the categories obtains a final score that allows the teacher to analyse the degree of creativity in the narrative texts written by the students in a collaborative way. Furthermore, T_CREANT captures metaphorical language, metaphorical originality and the presence of humor as characteristics of creative language. Educational implications of using T_CREANT to improve teaching-learning processes in narrative writing will be discussed.

Session N 26

25 August 2023 14:45 - 16:15
UOM_R01
Poster Presentation
Lifelong Learning, Teaching and Teacher Education

Digital Literacy, Teaching and Teacher Education and Professional Development

Keywords: Competencies, Critical Thinking, Digital Literacy and Learning, Early Childhood Education, Educational Technologies, In-service Teachers, Inquiry Learning, Lifelong Learning, Pre-service Teachers, Primary Education, Quantitative Methods, Self-efficacy, Teacher Professional Development
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development
Chairperson: Päivi Hökkä, University of Tampere, Finland

Digital team collaboration in kindergartens: An investigation using the Will-Skill-Tool Model
Keywords: Competencies, Digital Literacy and Learning, Early Childhood Education, Teacher Professional Development
Presenting Author: Sebastian Then, University of Bamberg, Germany; **Co-Author:**Matthias Borgstede, Otto-Friedrich-University of Bamberg, Germany; **Co-Author:**Yvonne Anders, Otto-Friedrich-University of Bamberg, Germany

This presentation deals with digital team collaboration in preschools. The aim is to find out to what extent preschool teachers use digital media in team collaboration and which factors influence their use based on the Will-Skill-Tool Model. In the context of this study, 886 preschool teachers from Germany participated in the survey. On average, preschool teachers use digital media in team collaboration less than once a month, but with a high variance. The results show that training, access to computers, technical support, beliefs and self-efficacy expectations are significant predictors for the use of digital media in team collaboration. In particular, technical support seems to be more significant than equipment alone.

Exploring the intentions and digital competence of pre-service primary school teachers in Ireland
Keywords: Competencies, Digital Literacy and Learning, Educational Technologies, Pre-service Teachers
Presenting Author: Denis Moynihan, Dublin City University, Ireland

This study will examine the self-reported digital competence and self-reported intentions of primary school level pre-service teachers (PSTs) to use digital technologies in their professional practice as part of teaching, learning and assessment. Through the use of a mixed-methods research approach, this study will firstly collect quantitative survey data from PSTs in order to explore and examine any relationships between their self-reported intentions and self-reported digital competence. Next, qualitative interview data will be collected from a subset of eight PSTs. These data will be thematically analysed in order to present understandings of the development of the intentions and digital competence of these PSTs through the unpacking of their rich lived experiences.

Teachers' digital competence - a broad set of comprehensive attitudes, skills, and knowledge
Keywords: Competencies, Digital Literacy and Learning, In-service Teachers, Primary Education
Presenting Author: Susanna Pöntinen, University of Eastern Finland, Finland; **Co-Author:**Sini Kontkanen, University of Eastern Finland, Finland; **Co-Author:**Sinikka Räty-Záborszky, University of Eastern Finland, Finland; **Co-Author:**Mira Kummunmäki, University of Eastern Finland, Finland

Teachers play a key role in fostering students' ability to act openly and goal-oriented ways in digital learning environments. Previous studies tell us that teachers' competence to develop teaching practices is more critical than e.g., the need to master isolated technical skills (Pöntinen & Räty-Záborszky, 2022). This can be also seen in digital competence frameworks for teachers which underline best digital practices (Redecker, 2017) and digital subject didactics (Kelentrić et al., 2017). Overall, it is important to bear in mind that promoting students' positive attitude towards learning in versatile digital learning situations can be a challenging task for teachers. Therefore, studies which aim to investigate how the teachers themselves experience digital classroom practices become important. In the poster, we present results of action research conducted in two Finnish primary school classrooms. The key knowledge, skills and attitudes needed for primary school teachers to support students' digital competence were investigated. The MAP model (Metsäpelto et al., 2021) was used to identify teachers' essential individual and teaching competences when they aim to foster students' digital competence (see Ilomäki et al., 2016). Our results show that teachers' digital competence closely related to social skills, higher-order thinking skills and professional well-being. Openness to respond to changing teaching

situations, positive future orientation and putting new ideas into practice were attitudes among others influencing teachers working. We conclude that digitally competent teachers orchestrate broad practices and strategies for responding to the needs of complexity of educational processes and versatile students' needs in digital era.

Effects of an ICT course on pre-service teachers' self-efficacy: A quasi-experimental study
Keywords: Digital Literacy and Learning, Pre-service Teachers, Quantitative Methods, Self-efficacy
Presenting Author: Sonja Hahn, Darmstadt University of Applied Sciences, Germany; **Co-Author:**Samuel Merk, PH Karlsruhe, Germany; **Co-Author:**Olga Kunina-Habenicht, Technical University of Dortmund, Germany

Along with the growing importance of educational technology, university courses fostering accompanying competencies and beliefs in pre-service teachers are emerging. However, few results from studies containing control groups are available. In our study, we focus on the effect of such a course on different self-efficacy scales in a quasi-experimental design. We administered self-report questionnaires capturing ICT-related self-efficacy in pre-service teachers with differing granularity (general statements vs. specific tasks) and with different focus (non-instructional vs. instructional ICT use). Participants from an introductory course on digital education (*N*=250) answered these scales along with demographic information at the beginning and at the end of the course. Additionally, participants from other introductory courses on research methods and inclusion took part as a quasi-experimental control group (*N*=360). In order to account for systematic differences between the two groups, we used the nearest neighbor matching procedure on multiply imputed data resulting in *N*=75 participants in each group. Preliminary results comparing the two groups on post-test scales revealed significant group differences on both scales capturing instructional ICT use, whereas differences on the remaining scales were not significant. Updated results will be presented at the conference. Results show that attending the general introductory course on digital education fosters self-efficacy beliefs on instructional ICT use. Findings on the non-instructional scales tend to favor participants attending this course, but do not reach significance. This underlines the relevance of using self-efficacy scales that match the content and learning goals of the course under investigation.

The effectiveness of long-term in-service training on teachers' professional development
Keywords: Digital Literacy and Learning, In-service Teachers, Lifelong Learning, Teacher Professional Development
Presenting Author: Sini Kontkanen, University of Eastern Finland, Finland; **Co-Author:**Susanna Pöntinen, University of Eastern Finland, Finland; **Co-Author:**Satu Piispa-Hakala, University of Eastern Finland, Finland

Society has become more digitized and digital technology has become increasingly central in curriculum; however, digital competence is still a complex phenomenon (Erstad et al., 2021). The need for digitally competent teachers has obviously increased (Instefjord & Munthe, 2017), but studies reveal that teachers are not qualified, and their training is insufficient (Fernández-Batanero et al., 2020). Since digital competence is considered as a key factor to improve teachers' professional development, our poster presentation focuses on the effectiveness of professional digital competence training for in-service teaches.
In the poster, we present aspects which in-service teachers assessed meaningful after taking part in long-term in-service teacher training program. The training aimed to support teachers to develop their digital competence, especially from pedagogical autonomy perspective and to explore digitalized learning and teaching research-based from the pedagogical perspective. Research data consisted of teachers interviews which were carried out in the end of the professional training program. Interviews were analysed by theory-driven content analysis identifying features that are related to the effectiveness of training programs presented by Arthur et al., (2003).
Our results show that in-service training program greatly impacted in-service teachers' professional development. Teachers estimated that they learned a lot during the training program, the training had a positive effect on their job description and career, and their skills conducting digital teaching practices improved significantly. As a conclusion, we suggest that long-term in-service teacher digital competence training program can effectively improve in-service teachers' professional development.

What do we do when we simulate? - a design-based research study
Keywords: Competencies, Critical Thinking, Digital Literacy and Learning, Inquiry Learning
Presenting Author: Sonja Bleymehl, Pädagogische Hochschule Ludwigsburg, Germany; **Co-Author:**Christine Bescherer, Pädagogische Hochschule Ludwigsburg, Germany

Since computer simulations are part of our everyday life, responsible citizens need to be able to reflect simulation results critically. To be capable of asking questions concerning assumptions made, used data, pursued purpose, etc., an epistemological understanding of simulation is needed. In German schools, simulations are often used as tools, but teachers rarely discuss simulations themselves.This study addresses teaching about simulations, their importance for science and chances as well as risks involved. A sequence of five math lessons for a 7^{th} grade in lower secondary schools on the topics model, modelling and simulation is under development. Beside the development of materials for teachers, the objective of this study is to investigate which competencies and skills are further developed by learning about simulations. Therefore, we follow a design-based research approach. A first pilot study was conducted.

Session N 27

25 August 2023 14:45 - 16:15
UOM_GYM
Roundtable
Assessment and Evaluation, Higher Education

Feedback and Assessment

Keywords: Assessment Methods, Classroom Assessment, Competencies, Cooperative/Collaborative Learning, Feedback, Higher Education, Motivation, Multimedia Learning, Quantitative Methods, Self-efficacy, Simulation-based Learning, Writing/Literacy
Interest group: SIG 01 - Assessment and Evaluation, SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Aleksandra Huic, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia

The effects of standardized and individualized feedback on self-efficacy and anxiety in writing
Keywords: Feedback, Motivation, Self-efficacy, Writing/Literacy
Presenting Author: Katrin Peltzer, Westfälische Wilhelms-Universität Münster (Münster University), Germany; **Presenting Author:**Alina Lira Lorca, Department of Educational Sciences, Oldenburg University, Germany; **Co-Author:**Ulrike-Marie Krause, University of Oldenburg, Germany; **Co-Author:**Vera Busse, Westfälische Wilhelms-Universität Münster, Germany

Writing is a complex undertaking requiring high levels of motivation and self-efficacy for students to maintain engagement in the process, and can pose particular challenges for foreign language (FL) learners. Formative feedback has the potential to support student writing and motivation, however, research examining the motivational effects of different formative feedback methods is scarce. We address this research gap and present data from our experimental intervention study that was conducted in English classes in Germany in Year 9, involving $N = 255$ students of English as a Foreign Language (EFL) . Feedback was implemented within a learning unit that focused on argumentative writing, and participants were randomly assigned to three experimental groups receiving different kinds of formative teacher feedback (individualized, standardized, or combined). We investigate changes in students' self-efficacy and anxiety through pre-, post- and follow-up assessments and compare the experimental conditions to two control groups (learning unit without feedback, no intervention). Data collection has already been completed, while data analysis is still ongoing.

A valid and reliable assessment tool of competencies in higher education
Keywords: Assessment Methods, Competencies, Feedback, Higher Education

Presenting Author: Kris Janssens, Hasselt University, Belgium; **Co-Author:**Annelies Vanheel, Hasselt University, Belgium; **Co-Author:**Bert Brône, Hasselt University, Belgium

Valid and reliable assessment of competencies in complex assignments such asbachelor's and master's theses and internships is a major challenge for every programme. We aimed to design a new tool in which we define clear assessment criteria and levels based on learning goals, guarantee the inter-rater reliability, offer transparency for students and evaluators, provide qualitative feedback for students (intermediate and afterwards), and maintain it time efficiently, user friendly and feasible for large groups. An assessment tool was developed based on rubrics with a unique underlying scoring system for the different parts of the assessment (process, report, presentation) of the bachelor's and master's theses and different internships of the bachelor and master in biomedical sciences. The underlying scoring system varies throughout the different years, as more advanced competence levels are expected in higher years. To summarize the assessment process, the students and evaluators receive the rubrics at the start of the internship or thesis to achieve transparency. Formative assessment is provided intermediate using the assessment tool and working points are identified and discussed. At the end of the internship, the assessment tool is completed for summative evaluation and the students receive the rubrics, feedback and score. Throughout the last 5 years, analyzing the results in addition to focus groups has led to optimization of the assessment tool and finally to a valid and reliable assessment in which students are provided with qualitative feedback and can monitor their progress.

The influence of item design on test performance
Keywords: Assessment Methods, Classroom Assessment, Multimedia Learning, Quantitative Methods
Presenting Author: Tamara Schleepen, Open Universiteit, Department of Online Learning and Instruction, Netherlands; **Co-Author:**Desirée Joosten-ten Brinke, Open University of the Netherlands, Netherlands

In a national school system, a central exam is offered to all students. The results of this exam, combined with teachers' perception of students' academic performances and future abilities, will determine students' entry level in secondary education. The central exam is provided by six different item constructors that schools may choose from. In this exam, items are presented with pictures or illustrations as context information. These exams require students to be able to interpret the information from the multimedia offered (text combined with pictures). The question is whether a student's test performance depends on the design of the items. In this round table, we would like to elaborate on the possible effects of item design causing differences in performance. We would like to show participants different appearances of items and discuss if and how the design played a role in student performance.

Automated Feedback and Learning Design for Collaborative Problem Solving in Simulation Scenarios
Keywords: Cooperative/Collaborative Learning, Feedback, Higher Education, Simulation-based Learning
Presenting Author: Daniel Sanchez, University of Oslo, Norway; **Co-Author:**Rachelle Esterhazy, University of Oslo, Norway; **Co-Author:**Crina Damsa, University of Oslo, Norway

Despite the proliferation of automatic tools that aim to support collaborative learning, little is understood about how feedback generated by these tools is integrated in simulation-based learning design. This gap is critical as it pinpoints how different ways of combining learning design elements and automated feedback create opportunities for learners to collaborate and engage with knowledge in productive ways. This study uses a design-based research and participatory design approach in a high-fidelity simulation-based learning design in nursing education. The study seeks to identify how teachers initially conceive automated feedback as part of their learning design and how they gradually adjust both feedback and learning design in light of empirical evidence. It does so by taking a departure point in models based on research literature and by analysing multiple data sources: observations of simulations, records from co-design meetings, usability testing, user experience (UX) review, and teacher interviews. Findings from these analyses will feed into future developments of automated feedback in collaborative settings.

Session N 28

25 August 2023 14:45 - 16:15
UOM_R09
ICT Demonstration
Assessment and Evaluation

A Demonstration and Tutorial of Open Creativity Scoring: Freeware for Educational Researchers

Keywords: Artificial Intelligence, Assessment Methods, Creativity/Divergent Thinking, Quantitative Methods
Interest group:

Please bring your own device if you are attending this ICT demonstration.
Open Creativity Scoring (OCS) is a web-based freeware that is designed to automatically quantify the creativity of responses to verbal divergent thinking tasks via artificial intelligence models from both adult and child participants (see link: https://openscoring.du.edu/). Hosted on a University of Denver server, the freeware can be accessed from any computer connected to the internet and is intended to support the massive 'scaling up' of creativity research within the educational setting. In this demonstration, the creators of the freeware will present a step-by-step demonstration of how to use it, along with a hands-on tutorial that will be designed to get researchers set up to process their own data. Functions related to the measurement of Originality, Fluency, and Elaboration for either adult or child participants will be demonstrated.

A Demonstration and Tutorial of Open Creativity Scoring: Freeware for Educational Researchers
Presenting Author: Denis Dumas, University of Georgia, United States; **Co-Author:**Peter Organisciak, University of Denver, United States; **Co-Author:**Selcuk Acar, University of North Texas, United States

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Session O 1

25 August 2023 17:00 - 18:30
HELEXPO_CC
Invited Symposium
Lifelong Learning, Teaching and Teacher Education

Intensive longitudinal methods – The way forward in researching professional learning

Keywords: Emotion and Affect, Informal Learning, Lifelong Learning, Motivation, Pre-service Teachers, Qualitative Methods, Quantitative Methods, Teacher Professional Development, Vocational Education and Apprenticeship Training
Interest group: SIG 14 - Learning and Professional Development
Chairperson: Michael Goller, University of Kassel, Germany
Organiser: Michael Goller, University of Kassel, Germany
Organiser: Maaike Endedijk, University of Twente, Netherlands

Organiser: Andreas Rausch, University of Mannheim, Germany
Discussant: Littlejohn Allison, University College London, United Kingdom

A large share of research on professional learning and development is based on cross-sectional research designs, using quantitative or qualitative methods aimed at understanding individual differences in employees' learning and development. Although such research is important on its own, it does not allow to investigate potential within-person variation–that is, "how experiences within one individual can differ depending on time or context" (Myin-Germeys & Kuppens, 2022, p. 17). To capture and understand potential within-person effects, (fine-grained) longitudinal data needs to be collected (e.g., using experience sampling) and analysed using appropriate methods. Without such research approaches, important dynamics that lie on the foundation of learning and development processes in work contexts might easily be overlooked, leading to a biassed or even false understanding of the world (Fisher et al., 2018) and wrong assumptions for the development of interventions. This symposium aims on explaining the need for intensive longitudinal methods as well as to illustrate the challenges of intervention and replication studies. On a more conceptual level, this will be done by the first presentation. The following three presentations will then illustrate distinct methodological approaches based on different empirical studies. The second presentation focuses on how to analyse longitudinal interval data on employees' basic psychological needs satisfaction, arousal, and emotions during daily work tasks using Bayesian multilevel modelling. The third presentation focuses on a microgenetic longitudinal approach using qualitative methods to investigate teachers in their professional contexts. The fourth presentation discusses the use of diary studies to investigate learning from errors.

Time for change: The promises of intensive longitudinal methods for the field of workplace learning
Presenting Author: Maaike Endedijk, University of Twente, Netherlands

An unprecedented speed of technological developments and societal transitions requires professionals to engage continuously in the process of up and reskilling. As the vast majority of professional learning occurs at the workplace, understanding how learning evolves at the workplace and how this can be supported is crucial. Decades of research on workplace learning has provided insights into essential building blocks for individual and contextual factors that drive the workplace learning process. However, factors explaining differences between persons are not necessarily the same ones explaining differences within persons. Intensive longitudinal methods and within-person analyses are required to find crucial moments of workplace learning and the right interplay of contextual factors for workplace learning to evolve. This contribution discusses promising examples to arrive at a better understanding of factors supporting the process of workplace learning, such as experience sampling studies or microgenetic studies. In addition, this paper will discuss the promises and perils of micro-interventions to adaptively support workplace learning. This theoretical paper will argue that it is time for a change. Time to change our methods to commensurate with the fluctuations in the process that we study and to find out which time-varying factors influence the process of workplace learning to build evidence-based support tools. Only then can our research field can truly support workers to remain employable and contribute to the major societal transitions.

Autonomy, emotions, arousal and development of competence in daily work situations
Presenting Author: Petri Nokelainen, Tampere University, Finland; **Co-Author:**Ilmari Puhakka, Tampere University, Finland; **Co-Author:**Eija Lehtonen, Tampere University, Finland

The current study used longitudinal interval-contingent design (Bolger & Laurenceau, 2013) to examine the relationship between the development of competence in different daily work situations and the prevailing emotional states (Pekrun & Perry, 2014), the experience of autonomy (Ryan & Deci, 2017) and the ambulatory measured levels of arousal (Boucsein, 2012). The data (N = 65) were collected in 2019 from the white-collar employees of two large Finnish engineering companies. Participants wore Moodmetric smart rings (arousal level from electrodermal activity, EDA, by one minute interval) for 3 to 9 days and self-reported three times per day work task related emotional states, experienced autonomy and development of competence via LearningTracker smartphone app (Nokelainen & Hartikainen, 2020). Results of two-level mixed-effects regression analysis indicated that both within and between-person level autonomy was the strongest (positive) predictor for competence. Also positive emotions had some predicting value related to higher levels of experienced competence. Within-person level arousal was weakly positively related to competence. Further investigation of within-person multilevel mediation showed that autonomy was positively associated with valence and arousal, but they did not have a mediating role in the model of competence development.

Two microgenetic studies on teacher learning: Investigating learning in process
Presenting Author: Alba Vallés, University of Lleida, Spain; **Co-Author:**Marc Clarà, University of Lleida, Spain

Unlike other longitudinal methods, microgenetic approaches permit us to observe learning phenomena while they happen, in process; therefore, these methods are especially adequate to investigate questions related to how learning phenomena happen. In this paper, we present two microgenetic studies about how teacher professional learning takes place, with the aim of providing the reader with a clear vision of how a microgenetic study looks like, why it is useful, and how it can be conducted in the field of professional learning. In the examination of the two studies, we focus on the observational setting, the analytical tools, and the kind of results obtained, in order to provide readers with diverse resources and models that can inspire further microgenetic research in the field.

Replicating and extending a diary study on emotions, coping and learning in error situations at work
Presenting Author: Andreas Rausch, University of Mannheim, Germany

Learning from errors is a complex and dynamic process that includes contextual characteristics, individual coping approaches, and emotional experience. Semi-standardised diaries allow to collect this fluctuating data near real-time and adapt to natural settings. However, this makes every diary study unique and hard to replicate. The present study is an extended replication study of Rausch et al. (2017; Journal of Workplace Learning, Vol. 29, No. 5, 374). Fifty-one young employees of a Rural District Office participated in the voluntary study and recorded n = 352 error situations. Some findings from the original study were replicated but some were not. Surprisingly, the emotion-focused coping approach of self-blaming showed one of the highest correlations with self-perceived learning from the error situation (r = .50) while it showed almost no correlation in the original study. Furthermore, an additional assessment of one's emotional experience after coping showed that emotions during error processes are very dynamic and therefore the time of measurement matters. Finally, the additional coping approaches were selected very frequently suggesting that these coping approaches also played a role in the first study but were not recorded. In general, reproducibility, robustness, and replicability are important criteria for the credibility of an empirical study. Since research on workplace learning is based on still evolving theoretical frameworks and conducted with field studies in various contexts, exact replications are impossible. This is particularly the case when using intensive longitudinal methods. Nevertheless, replication studies provide important information on the validity and generalizability of original findings.

Session O 2

25 August 2023 17:00 - 18:30
UOM_CH
Invited Symposium
Learning and Special Education

Fundamental academic learning in students with various educational needs - longitudinal evidence

Keywords: Anxiety and Stress, At-risk Students, Cognitive Development, Learning and Developmental Difficulties, Learning and Developmental Disabilities, Mathematics/Numeracy, Quantitative Methods, Special Education
Interest group: SIG 15 - Special Educational Needs
Chairperson: Pirjo Aunio, University of Helsinki, Finland
Organiser: Pirjo Aunio, University of Helsinki, Finland
Discussant: Kerry Lee, The Education University of Hong Kong, Hong Kong

This symposium analyzes the cognitive mechanisms of learning difficulties in typical and atypical populations using longitudinal samples. So far, most specific learning difficulties research has concentrated on rather small sets of predictive variables and groups of children studied cross-sectionally. Data in our symposia were obtained using longitudinal designs with four different age groups and countries (Belgium, Netherlands, Finland, United Kingdom) (Table). The data

presented includes 976 participants in total. The following analysis methods were used: variance, correlation and Structural Equation Modeling (confirmatory factor, latent growth curve, mediation). In general, these findings suggest that a wide range of cognitive as well as emotional factors have an effect on development of learning difficulties. Importantly, the use of longitudinal data, using the same participants, show that the factors that impact on positive outcome or learning difficulties changes over development. As such, the important value of this symposium is that longitudinal samples contribute in understanding the predictive value of cognitive and emotional variables in children and adults learning and learning difficulties. It highlights the importance of following children who have at risk for learning difficulties, taking account various cognitive, linguistic and emotional factors, as the impact of them varies also over time to learning of fundamental academic skills. This knowledge is important for identifying students in need for extra and/or special educational support and in providing them support.

The Cognitive Profile of Preschoolers at Risk for Dyslexia and ADHD
Presenting Author: Silke Kellens, Katholieke Universiteit Leuven, Belgium; **Co-Author:**Dieter Baeyens, KU Leuven, Belgium; **Co-Author:**Pol Ghesquière, KU Leuven, Belgium

Dyslexia and ADHD frequently co-occur, as approximately 15-40% of children with one diagnosis also have symptoms of the other. However, in prospective research, preschoolers at risk for dyslexia and ADHD are often neglected. Yet, insight into the cognitive profile of these at-risk children might enhance early identification and remediation. Therefore, overall, our study aimed to investigate the cognitive development of preschoolers at risk for dyslexia and/or ADHD and typically developing preschoolers, by following them up longitudinally from preschool (age 5) to third grade (age 8) (N = 178 in third grade). In this presentation, we specifically compared preschool risk status to cognitive deficits and investigated to what extent these preschool deficits were related to later formal diagnoses in third grade. Prospectively, we examined the likelihood of working memory (WM), processing speed (PS), or inhibition deficits in specific risk groups through an individual deviance analysis. The results showed that when a WM, PS, or inhibition deficit was present in preschool, most children were simultaneously at risk for dyslexia, with or without ADHD. Additionally, we retrospectively assessed the relation between these preschool deficits and the probability of a formal diagnosis of ADHD and/or dyslexia by the time they were in third grade. These specific preschool deficits were indeed associated with later difficulties, as preschool WM and PS deficits were related to the probability of a future diagnosis of ADHD and/or dyslexia. This study's results highlight the importance of cognition in identifying children with special educational needs and developing interventions for these children.

Linguistic Precursors of Advanced Math Growth in Children with and without DLD
Presenting Author: Eliane Segers, Radboud University, Netherlands; **Co-Author:**Constance Vissers, Radboud University, Netherlands; **Co-Author:**Tijs Kleemans, Radboud University, Netherlands

The first aim of the present study was to examine the differences between children with and without Developmental Language Disorder (DLD) in advanced mathematics. Secondly, we investigated the extent to which the basic and advanced linguistic skills of children with and without DLD directly and indirectly (through arithmetic) predict their growth in advanced mathematics from fourth to sixth grade. Participants were 59 children with DLD and 136 typically developing peers from 9 to 11 years of age. Classroom as well as individual measures were administered. First, the preliminary results in fourth grade showed children with DLD to score below their peers on both basic arithmetic skills and advanced mathematics. With respect to the second research question, indirect effects of phonological awareness and naming speed, via basic arithmetic skills, on geometry and fractions were found to be equally strong for both groups. Furthermore, similar strengths for both groups were found for nonverbal intelligence and academic vocabulary, in directly predicting the scores in advanced mathematics. Overall, these results highlight the general need for opportunities to learn the basic and advanced linguistic skills associated with mathematics over the extent in which linguistic skills are impaired.

Developmental trajectories of math anxiety and performance in lower secondary education
Presenting Author: Johan Korhonen, Åbo Akademi University, Finland; **Co-Author:**Anna Widlund, Åbo Akademi University, Finland; **Co-Author:**Pekka Räsänen, Univerisity of Turku, Finland

Math anxiety (MA) is thought to increase during schooling and reach peak levels during adolescence. However, there are surprisingly few studies that have investigated developmental patterns of MA in general, and during adolescence in particular. Thus, this study sought to address these research gaps by investigating the development of MA and performance from grade 7 to grade 9 across 4 time points in a sample of Finnish lower secondary students (N = 583). MA was measured with a five-item scale inspired by the Math Anxiety Rating Scale and math performance was measured with a standardized math test. Longitudinal confirmatory factor analyses supported measurement invariance of the MA scale across time. Latent growth mixture modeling identified two distinct groups that differed in their MA initial level and development. The typical group (N=460) had low initial level of MA in grade 7, which showed a stable developmental trend across lower secondary education. The MA group (N = 123) had higher initial level of MA in grade 7 and exhibited a steep increase during grade 7 which levelled out in the end of lower secondary education. Both groups developed similarly in math performance although the MA group started with lower scores in grade 7.

Mathematical Abilities in Williams syndrome: Longitudinal findings from the WisDom Database
Presenting Author: Jo Van Herwegen, UCL Institute of Education, United Kingdom; **Co-Author:**Stella Xu, UCL- Institute of Education, United Kingdom; **Co-Author:**Harry Purser, The Nottingham Trent University, United Kingdom; **Co-Author:**Michael Thomas, Birkbeck College, University of London, United Kingdom

Williams syndrome (WS) is a rare genetic syndrome that results in an uneven cognitive profile and many individuals with WS are delayed in their mathematical abilities. The current study is the first study to examine the long-term mathematical abilities of 20 individuals with WS using data from the WiSDom database that brings data together from several labs in the UK combined with newly obtained data. The results showed that, over a time period of more than 10 years, mathematical abilities (as assessed by Quantitative Reasoning task from British Ability Scales) improved in younger as well as older participants with WS but this improvement was larger for those who had a longer time difference between the two assessment points in both groups. There was no effect for age group or interaction between age group and mathematical ability improvements. There were a wider range of statistical significant correlational analyses at T2 compared to T1, suggesting spread of compensatory strategies or that as a resolution to narrow barriers of success a wide range of abilities become relevant to mathematical abilities over time. These and other explanations will be discussed.

Session O 3

25 August 2023 17:00 - 18:30
AUTH_CH
Invited Symposium
Learning and Social Interaction

Social sustainability efforts and learning experiences in diverse and multicultural practices

Keywords: Communication Skills, Communities of Learners and/or Practice, Cultural Diversity in School, Digital Literacy and Learning, Educational Policy, Foreign and Second Language Acquisition, Game-based Learning, Immersive Technologies for Learning, Informal Learning, Migrant / Refugee and Minority students, Mindsets, Social Aspects of Learning and Teaching, Social Interaction, Social Media, Sustainable Development
Interest group: SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Gudrun Ziegler, Luxembourg
Chairperson: Andreas Gegenfurtner, University of Augsburg, Germany
Organiser: Maria Bäcke, University of Jönköping, School of Education and Communication, Sweden
Discussant: Sikunder Ali, Norwegian University of Science and Technology (NTNU), Norway

In this symposium, we explore cross-cultural interactions including identities, discourses and practices in education environments and how participatory decision-making processes influence language ideologies and language practices that emerge from, construct, or contest cultural beliefs and norms. These have an impact on social sustainability in multicultural and complex educational practices, which affect feelings of hope for students as well as educators. For

education to become a force for hope in society, we explore societal polarization and issues of center-peripheries bound up with the challenges of consuming, interpreting, and participating in everyday digital communities of practice from the perspectives of sociocultural learning and social sustainability. Sustainability and digitalization are highlighted in educational curricula all over the world (United Nations, 2021; European Commission, 2020), and digitalization initiatives are framed as reimagining, revitalizing, and resetting education to increase inclusivity and accessibility (Facer & Selwyn, 2021), thus emphasising aspects of both education and social sustainability. While focusing on environmental and economic dimensions of sustainability, social sustainability rarely receives significant attention. Our focus on decoding how diverse and complex multicultural practices explores the interplay between learning, digital practices, and social sustainability. The core objective is to understand and address the richness and potential of the complexities, challenges, and this symposium address it from a range of different communicative and learning perspectives and through a variety of methodological and theoretical approaches. Few areas bring together these as strongly as education with respect to how learning, digital practices, and social sustainability may be more thoroughly integrated with the aim to further hope.

Individualising Swedish for Immigrants: Tensions and innovations in teachers' professional practice
Presenting Author: Dimitrios Papadopoulos, University of Gothenburg, Sweden

Individualising processes in adult education contexts have emerged over several decades as all-embracing solutions to identified societal challenges (Fenwick, 2003). As a consequence, demands are placed on educational organisations and teachers to enact individualised pedagogical practices addressing the needs of increasingly diverse student groups. Previous research has shown that individualisation has a plethora of expressions and implications for adult education systems worldwide, as it is raised by a variety of societal needs causing several transformations of adult education. In Sweden, demands to offer tailor-made programmes and solutions for diverse adult student groups become increasingly evident in policy landscape (Fejes et al., 2018). One such example is Municipal Adult Education in Swedish for Immigrants (SFI), a program often seen as a labour-market instrument that offers basic knowledge of the Swedish language to adult immigrant students. Key policy documents, such as Curriculum for Adult Education (Skolverket, 2017) and program syllabus (Skolverket, 2022), define students' needs and conditions as the point of departure for SFI. Through deregulation and marketisation processes, Swedish adult education organisations are expected to be transformed by creating flexible conditions and by expanding the connections of SFI with other societal actors, such as labour market and integration policy makers. At the same time, large-scale features of global phenomena, such as COVID19 pandemic, create a landscape of uncertainty due to their acute character. In this context, SFI teachers are expected to enact innovative pedagogies in supposedly flexible educational frameworks which, nevertheless, provide limited margins of manoeuvre.

Transmedia Educommunication Method for Social Sustainability
Presenting Author: Maria Bäcke, University of Jönköping, School of Education and Communication, Sweden; **Co-Author:**Renira Gambarato, Jönköping University, Sweden; **Co-Author:**Lorena Tárcia, Centro Universitário de Belo Horizonte, Brazil; **Co-Author:**Geane Alzamora, Universidade Federal de Minas Gerais, Brazil; **Co-Author:**Leo Cunha, Puc-MG, Brazil

In the post-pandemic world, we see the exacerbation of digital connections but also inequalities between countries with higher or lower degrees of access to fast Internet services. Digitization processes enable and intensify global exchanges and yet expand disconnections as they globalize debates and solutions without considering the different levels of accessibility, digital literacy, and Internet infrastructure in less privileged communities. Such discrepancies are reflected in learning levels and, consequently, in the development of social sustainability. The original transmedia educommunication method discussed here consists of a week-long gamified intervention in schools with students between 11 and 14 years old. Through this experience, we aim to develop media and text literacy skills in students and teachers. Our objective is to give them the tools to distinguish between textual genres and their purposes.

Invisible and unrecognised global citizenship and diversity among students at upper secondary level
Presenting Author: Maria Bäcke, University of Jönköping, School of Education and Communication, Sweden; **Co-Author:**Sylvi Vigmo, University of Gothenburg, Sweden

A survey on reading at Swedish upper secondary level (conducted by us in Spring 2022) generated 712 responses in a student body of 1,500 students. As many as 41 languages were distributed among them and we were surprised to learn that the teacher team was largely unaware of the linguistic variety among students. Our aim then became to explore how students framed language skills, when and in what contexts these were used, and for what purposes. We conducted six follow-up focus group interviews with 27 students and it became evident that diverse linguistic backgrounds were not only invisible in the school setting, they were also downplayed by the students themselves, who sometimes seemed to regard their language skills as inferior and drew on these informally only, often as a part of their everyday digital media use.

Reading for pleasure and reading for school – Student agency vs normative curricula
Presenting Author: Sylvi Vigmo, University of Gothenburg, Sweden; **Co-Author:**Maria Bäcke, University of Jönköping, School of Education and Communication, Sweden

Emanating from a collaboration with practicing teachers at a Swedish upper secondary school, and their experiences of challenges concerning their students' reading, a survey was given to a student body of 1,500 students, resulting in 712 responses. With the aim of investigating students' perspectives and reading in school, and out-of the curricula context, the survey also invited students to formulate thoughts on reading habits, experiences and personal views in several open-ended questions. The results indicate there is a gap between the reading norms in curricula, and the reading that occurs beyond "schooling", not only regarding other media genres than fiction but also regarding how mandatory reading negatively impacts motivation and reading with pleasure. The survey results are discussed from perspectives on critical literacy and social sustainability.

Session O 4

25 August 2023 17:00 - 18:30
AUTH_DC3
Symposium
Teaching and Teacher Education

Understanding teaching quality in the Nordic context using a shared observation system

Keywords: Qualitative Methods, Quantitative Methods, Teaching/Instructional Strategies, Video-based Learning
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Kirsti Klette, University of Oslo, Norway
Organiser: Mark WHite, University of Oslo, Norway
Discussant: Pamela Grossman, University of Pennsylvania, United States

Significant advancements have been made in conceptualizing, operationalizing, and measuring teaching quality in the last two decades. The development of observation systems has paved the way for a more targeted and systematic measurement of features of teaching quality across contexts. The goal of this symposium is to present the results of an effort to study instruction, drawing on video data from lower secondary mathematics and language arts classrooms in all Nordic countries. The papers within show how systematic coding can serve to generate broad pictures of instructional practice and can serve as a starting point to guide richer qualitative explorations of videos. The symposium demonstrates how the common framework and conceptual language provided by the observation manual can serve as the starting point for supporting deeper collaborations in the study of teaching quality. The four papers provide a first step for our comparative classroom ambition in the newly funded Nordic Center of Excellence "Quality in Nordic Teaching" (QUINT). The first paper provides an overview of key findings based on using a common observational measure across Nordic lower-secondary classrooms. The second paper investigates the role of purpose and feedback within Icelandic classrooms across math and language arts. The third and fourth paper dig into, respectively, features of high quality classroom discourses in language arts and characteristics of cognitively activating mathematics classrooms. Together these four papers summarize dilemmas and developments in our search for trying to understand features of high quality classroom teaching and learning relevant for Nordic classrooms and beyond.

Observation manuals as lenses into classroom teaching – towards a common language of instruction?
Presenting Author: Kirsti Klette, University of Oslo, Norway; **Co-Author:**Astrid Roe, University of Oslo, Faculty of Education, Norway; **Co-Author:**Marte Blikstad-Balas, University of Oslo, Norway; **Co-Author:**Mark WHite, University of Oslo, Norway; **Co-Author:**Michael Tengberg, Karlstad University, Sweden

Classroom-based observational research is important for focusing attention directly on instructional practices. The use of observation systems, which combine a well-defined conceptualization of teaching quality with an instrument to measure that conceptualization, creates the potential to drive systematic and cumulative research on instructional practice. This paper presents the results of such an effort, which systematically applied the Protocol for Language Arts Teaching Observation (PLATO) across the Nordic lower-secondary math and language arts classrooms. This application of PLATO provides a broad picture of instructional practices across countries and subjects, supporting and providing coherence to further, qualitative explorations of instructional practices. We discuss the results of applying the PLATO instrument across settings and the affordances that this provides to more targeted efforts to examine instructional practices within these settings. Our findings suggest, for example, rather similar patterns of instruction across countries and subjects and with systematically high scores on some elements (Time Management and Behavioral Management) and mediocre to low scores on other elements (Classroom Discourse; Representation of Content and Strategy Instruction, Modelling, and Feedback). We find that the use of PLATO facilitated both collaborations across researchers and accumulation of understandings of instructional practice.

Stated Purpose and Feedback practices in Icelandic classrooms: Results from a video study
Presenting Author: Berglind Gisladottir, University of Iceland School of Education, Iceland; **Co-Author:**Birna María Svanbjörnsdóttir, University of Akureyri, Iceland; **Co-Author:**Sólveig Zophoníasdóttir, University of Akureyri, Iceland

The aim of the study was to provide insight into teaching quality in Icelandic lower secondary classrooms, specifically the use of feedback and stated purpose in mathematics and language arts lessons. The study used classroom video-data that were recorded in grade eight in 10 Icelandic schools. The data were analysed according to the PLATO protocol, a standardized observation instrument for teaching quality. Findings showed that in majority of observed lessons, purpose and feedback were at the lower end of the PLATO observation protocol, indicating limited evidence for quality feedback to students and explicit purposes. Furthermore, there was limited evidence for a clear connection between the elements of purpose and feedback in the observed teaching practices.

Features of language arts classrooms with high-level classroom discourse across Nordic contexts
Presenting Author: Camilla Magnusson, University of Oslo, Norway; **Co-Author:**Kirsti Klette, University of Oslo, Norway; **Co-Author:**Jennifer Luoto, University of Oslo, Norway; **Co-Author:**Marte Blikstad-Balas, University of Oslo, Norway

Through video observations, this study explores characteristics of classroom discourse across 109 videotaped language arts lessons from three Nordic contexts: Norway, Denmark, and Sweden. Although numerous studies have examined classroom discourse patterns, few studies have focused on whether and how high-level classroom discourse patterns differ across national contexts. We address these issues by qualitatively exploring lessons with high scores on the classroom discourse element, as measured by the Protocol of Language Arts Teaching Observation manual, by looking in particular at students' opportunities to talk, and how these opportunities are used through teachers' uptake of student utterances. The findings show that high level classroom discourse share many of the same key characteristics regardless of national context, such as 1) most discussions concentrate around literature discussions/discussions on narrative texts, 2) teachers use a mix of question types, and 3) teacher uptake consist of a mix of asking for elaborations, clarifications, and justifications as well as revoicing the student utterances. This study thus provides insights into classroom discourse in Nordic language arts classrooms by shedding light on key characteristics of high-level discourse across three different Nordic contexts.

Characteristics of cognitively activating Nordic mathematics classrooms
Presenting Author:Jóhann Örn Sigurjónsson, University of Akureyri, Iceland; **Co-Author:**Alexander Selling, ILS, University of Oslo, Norway

Cognitive activation is a dimension of teaching quality that describes the degree to which teachers address the educational goal of student understanding. Presenting a clear and explicit purpose to support student understanding of lesson goals can support the goal of student understanding. Developing deeper understandings of practices that support high-cognitive activation has both practical and theoretical implications. This paper aims to enrich empirical understandings of teacher-student interactions in lessons considered cognitively activating. Eight mathematics lessons with outstanding cognitive activation scores were purposefully sampled and analyzed using content analysis and thematic analysis. The selected lessons greatly varied in terms of both instructional formats and the mathematical content being taught. The lessons showed teachers who emphasized student understanding through mathematical connection-making, frequent shifts between types of interactions, formative feedback and use of explicit student roles to facilitate engagement. Three out of eight lessons had purpose scored at a high level. The paper presentation will further describe how, when, and to what extent the purpose of the lessons was communicated and manifested in teacher-student interactions. The paper contributes to the knowledge of different dimensions of teaching quality, including those addressing student understanding, i.e., cognitive activation, and communication of learning goals.

Session O 5

25 August 2023 17:00 - 18:30
AUTH_DC2
Symposium
Learning and Instructional Technology

(Intelligent) Tutoring Systems and Their Affordances as a Research Tool From Multiple Perspectives

Keywords: Achievement, Artificial Intelligence, Computer-assisted Learning, Educational Technologies, Feedback, Foreign and Second Language Acquisition, Learning Analytics, Mathematics/Numeracy, Motivation, Primary Education, Problem Solving, Teaching/Instructional Strategies
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Cora Parrisius, University of Education Karlsruhe, Germany
Chairperson: Hannah Deininger, University of Tübingen, Germany
Discussant: Vincent Aleven, Carnegie Mellon University, United States

Within the last years, the application of intelligent tutoring systems (ITS) in educational practice became more and more common, not least stimulated by the COVID-19 pandemic. ITS are developed to provide learners with individual learning and practicing opportunities, thereby addressing the learner's individual needs. They are thought to be used in individual learning phases without the need for a human instructor, thus working towards decreasing educational injustice. However, besides their apparent advantages for educational practice (e.g., through individual feedback or automated exercise or content selection), ITS also show a high potential to serve as a research tool itself. Given the fact that ITS are at the same time content and learning opportunity provider, a learning companion, and data collector, ITS introduce new opportunities to the landscape of research methods. The main objective of this symposium is to highlight different affordances of ITS as a research tool by adopting perspectives from the fields of learning analytics (stressing the added value of access to behavioral trace data and explainable AI methods to predict learning outcome), intervention research (emphasizing the value of ITS to implement different intervention conditions with reduced thread of spillover contamination), personalization (highlighting the affordances of ITS to enable personalization while also showing its positive effects on student interests), and technology-enhanced teaching (illustrating the possibility provided by ITS to triangulate information about learner performance, classroom events, and teachers' teaching). The findings will be discussed in light of their relevance for research on learning and instructional technology.

Analyzing Behavioral Trace Data with Machine Learning and Explainable AI to Predict Learning Success
Presenting Author: Hannah Deininger, University of Tübingen, Germany; **Co-Author:**Cora Parrisius, University of Education Karlsruhe, Germany; **Co-Author:**Leona Colling, University of Tübingen, Germany; **Co-Author:**Ines Pieronczyk, University of Tübingen, Germany; **Co-Author:**Detmar Meurers, University of Tübingen, Germany; **Co-Author:**Ulrich Trautwein, University of Tübingen, Germany; **Co-Author:**Benjamin Nagengast, Eberhard Karls Universität Tübingen,

Germany; **Co-Author:**Gjergji Kasneci, University of Tübingen, Germany

In research on education, determining variables that contribute to learning success is an important goal. Typically, investigated variables include demographics, achievement measures, and survey data. With the rise of intelligent tutoring systems in educational practice, there is potential to easily collect data on students' practicing behavior. Understanding what behavior is relevant to students' learning, could help teachers to support students better. To analyze which practice behavior is related to learning success, machine learning methods are a suitable approach. Yet, it has been argued that machine learning models are not interpretable by humans, thereby restricting their utility for studying human learning. However, explainable AI frameworks can be used to obtain explanations of the model's decision path.Based on data from a cluster-randomized controlled field trial conducted in schools (N = 472 students), we trained several machine learning models based on demographics, achievement measures, and behavioral data from an intelligent tutoring system to predict students learning success. XGBoost showed the best predictive accuracy and was combined with an explainable AI component to illuminate which variables impacted learning success most. Overall, pretest scores had the highest impact on learning success with higher pretest values related to higher learning success. However, behavior-related variables had an impact on the model output, too, which indicates that particular interaction behaviors lead to better learning, independently of the student's basic abilities. Using intelligent tutoring systems as a tool to observe practicing behavior could help to further understand the impact of such behavior on learning success.

Effective Features of Feedback in an Intelligent Tutoring System: A Randomized Controlled Trial
Presenting Author: Cora Parrisius, University of Education Karlsruhe, Germany; **Co-Author:**Katharina Wendebourg, University of Tübingen, Germany; **Co-Author:**Sven Rieger, University of Tübingen, Germany; **Co-Author:**Ines Loll, University of Trier, Germany; **Co-Author:**Diana Pili-Moss, Leuphana University Lüneburg, Germany; **Co-Author:**Leona Colling, University of Tübingen, Germany; **Co-Author:**Carolyn Blume, TU Dortmund University, Germany; **Co-Author:**Ines Pieronczyk, University of Tübingen, Germany; **Co-Author:**Heiko Holz, Novatec Consulting GmbH, Germany; **Co-Author:**Stephen Bodnar, University of Tübingen, Germany; **Co-Author:**Torben Schmidt, Leuphana University Lüneburg, Germany; **Co-Author:**Ulrich Trautwein, University of Tübingen, Germany; **Co-Author:**Detmar Meurers, University of Tübingen, Germany; **Co-Author:**Benjamin Nagengast, Eberhard Karls Universität Tübingen, Germany

Automatic feedback has increasingly been considered in foreign language learning as it can be highly beneficial when provided by an intelligent tutoring system (ITS). However, it remains an open question what features of automatic feedback (e.g., metalinguistic, criterion-referenced, or motivational) are effective in supporting language learning. In this study, we made use of the ITS FeedBook and the affordance of ITS to easily implement different intervention conditions at the individual level with alleviated thread of spillover effects. The FeedBook is an ITS for English learning developed for seventh-graders in German secondary schools. A first study on the FeedBook found larger learning gains for students who received automatic, scaffolded, and individualized feedback as compared with students who only received correctness-of-response feedback. In the current follow-up trial, we tested for the effectiveness of the scaffolded feedback with a larger sample of $N = 616$ students. Furthermore, we tested for positive effects on students' English proficiency if criterion-referenced feedback (i.e., a dashboard informing students about their performance level in relation to a set learning goal) and motivational elements (i.e., a pedagogical agent presenting praise sentences) were added to the FeedBook. Even though we could not replicate the positive effects of the scaffolded feedback by the Meurers et al. study in this 1-year investigation, students reached partly higher test results when receiving criterion-referenced and additionally motivational feedback. We will discuss the use of the FeedBook as helpful research tool to facilitate complex research designs in field research.

The Effect of Career-Personalized Mathematics Instruction on Students' Learning and Interests
Presenting Author: Matthew Bernacki, University of North Carolina at Chapel Hill, United States; **Co-Author:**Candace Walkington, Southern Methodist University, United States; **Co-Author:**Vanessa Vongkulluksn, University of Nevada, Las Vegas, United States; **Co-Author:**Meghan J. Greene, University of North Carolina at Chapel Hill, United States; **Co-Author:**Taylor Darwin, Texas Tech University, United States; **Co-Author:**Brooke Istas, Southern Methodist University, United States; **Co-Author:**Elizabeth Leyva, Texas A&M University - San Antonio, United States

Personalizing instruction to students' interests has been shown to increase students' interest, performance, and learning in academic domains, although effects have varied significantly between studies documented in the literature. Most prior studies of context personalization in mathematics education have presented students with personalized math problems to solve, and these math problems have been personalized to students' everyday or popular culture interests (e.g., sports, locations students are familiar with). In the present study, we used a 2 × 2 randomized-control experimental design to test the effects of two design approaches to personalization: personalization by having students pose their own math problems (rather than just solve problems), and personalization to students' career interests (rather than their popular culture or everyday interests). We designed a series of activities in ASSISTments that presented middle school, high school, and community college students in Algebra courses with personalized (or typical business-as-usual) activities over 3 to 4 units. We found that personalized problem-posing increased students' algebra learning, but decreased their STEM career interest or their mathematics interest. We discuss how these design choices and those of and additional variables impact the implementation of personalized education.

Adaptive Learning Technologies and Dashboards as an Instrumentation Tool to Study Teachers
Presenting Author: Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Carolien A. N. Knoop-van Campen, Radboud University Nijmegen, Netherlands

Background. In the literature, it has been proposed that educational technologies can be used to better understand how learners learn using instrumentation tools. Adaptive learning technologies (ALT) are increasingly used in Dutch primary education. In these technologies, students practice math, spelling, and grammar at a level adjusted to their needs, while teachers are provided with concurrent information about students' progress via teacher dashboards. Indeed, ALTs can be used to understand students' learning better, but at the same time, they can help us understand teachers' feedback and teaching practices better. *Aim.* In this contribution, we discuss how teacher feedback and teaching practices can be examined with ALTs and dashboards based on findings from 4 selected studies. This helps us to understand how ALTs are not just a great instrumentation tool to study how learners learn, but also how teachers teach.*Results.* We outlined how ALTs can be used to examine teacher practices during teaching and how the methodology developed helps us advance our understanding of teachers' feedback practices. We illustrate how this approach contributed to advanced insights into teachers' practices in multiple studies. *Conclusion.* Adaptive learning technologies and dashboards can indeed be used as an instrumentation tool to better understand teaching practices.

Session O 6

25 August 2023 17:00 - 18:30
UOM_A02
Symposium

Teacher-Student Relationships in Education—What we know and what we don't (yet) know

Keywords: Achievement, Developmental Processes, Large-scale Assessment, Meta-analysis, School Effectiveness, Social Aspects of Learning and Teaching, Social Interaction, Teaching Approaches, Teaching/Instructional Strategies
Interest group: SIG 18 - Educational Effectiveness and Improvement
Chairperson: Valentin Emslander, Luxembourg
Discussant: Hinke Endedijk, Leiden University, Netherlands

Positive teacher-student relationships (TSR) are key to developing a good school climate in which both teachers and students can thrive. While existing research has brought to light the educational benefits of positive TSR, for instance, by showing that students in classrooms and schools with positive TSR tend to achieve better grades, the evidence base is scattered and lacks some key elements. Specifically, empirical studies on the benefits of positive TSR largely focused on academic achievement and less so on other, educationally relevant outcomes, such as socio-emotional skills, motivation, sense of belonging, or behavior. Moreover, TSR has often been conceptualized differently across studies, and its development in educational contexts has hardly been understood. This symposium aims to clarify some of these issues by presenting studies that (a) review the conceptualizations and definitions of TSR within the frameworks of school climate; (b) synthesize the evidence base on the relation between TSR and a broad range of educationally relevant outcomes; (c) identify longitudinal

trajectories of TSR and their relation to student engagement; and (d) examine the potential of TSR to facilitate a positive error culture and student participation in classrooms. Ultimately, we provide an updated, scientific overview of the existing body of knowledge about the conceptualization and educational potential of TSR and its current gaps. This overview shall not only inform scholars in the field but shall also encourage teachers to strive for positive TSR.

CANCELLED: A Systematic Review of Studies Examining School Climate and Student Outcomes
Presenting Author: Nani Teig, University of Oslo, Norway; **Co-Author:**Trude Nilsen, University of Oslo, Norway

School climate is a key factor in explaining student outcomes. Although several studies have reviewed existing research on the link between school climate and student outcomes, these studies only emphasized one or a few aspects of school climate and have rarely included data from international-large scale assessments (ILSAs). The present study aims to (1) describe how ILSAs conceptualize school climate and assess its multiple aspects: academic, community, safety, and institutional environment; and (2) review how studies using ILSA data identify the relations between different aspects of school climate and student outcomes in mathematics, science, and reading. In general, ILSA frameworks cover all aspects of school climate. While the academic, community, and institutional environment aspects are explicitly assessed at the student, class, or school levels, the safety aspect was less emphasized. Although ILSAs assess multiple aspects of school climate, studies included in this review mainly focused on investigating the academic aspect, particularly in examining teaching and learning. Few studies examined the community aspect, including the quality of teacher-student relationships. Concerning the relations between school climate aspects and student outcomes, this review reveals a high alignment between findings from the studies using ILSAs and other studies, including meta-analyses, reviews, and longitudinal studies. The implications of these findings are discussed in relation to improving the assessment of school climate in ILSAs and providing methodological recommendations and directions for future research on school climate using ILSA data.

Reviewing Meta-Analyses on the Link Between Teacher-Student Relationships and Student Outcomes
Presenting Author: Valentin Emslander, Universtiy of Luxembourg, Luxembourg; **Co-Author:**Doris Holzberger, Technical University of Munich (TUM) & ZIB (Centre for International Student Assessment), Germany; **Co-Author:**Antoine Fischbach, Luxembourg Centre for Educational Testing, Luxembourg; **Co-Author:**Ronny Scherer, University of Oslo, Norway

Background and Aims: Teacher-student relationships play a vital role in establishing a positive school climate and promoting positive student outcomes. Several meta-analyses suggested significant associations between teacher-student relationships and, for example, school engagement, good peer relationships, executive functioning, well-being, and little disruptive behavior. However, these meta-analyses differ substantially in their methods, moderators, and quality, thus complicating the interpretation of their findings. In this preregistered systematic review of meta-analyses, we aim to answer the following research questions: (RQ1) To what extent are student outcomes associated with teacher-student relationships? (RQ2) Which moderators influence these relationships, and how? (RQ3) What is the methodological quality of the included meta-analyses?Methods and Findings: In our review of 24 meta-analyses including more than one million participants, the strongest associations were found between negative teacher-student relationships and students' behavioral problems. Positive teacher-student relationships showed the strongest association with school involvement, prosocial, externalizing, and internalizing behaviors, and learning motivation combined with student involvement (RQ1). Age, gender, and informant (student-, peer-, or teacher-assessment) were the most frequently examined moderators (RQ2). Additionally, we found quality differences between the meta-analyses (RQ3).Significance: Considering our findings, we argue that teachers should be made aware of the potential impact of positive teacher-student relationships and how they could contribute to creating a positive school climate. To accompany the existing meta-analyses, we need experimental tests to causally confirm the impact positive teacher-student relationships can have as an effective strategy for improving student outcomes and school climate at large.

Student-Teacher Relationship Trajectories and Secondary Students' School Engagement
Presenting Author: Debora Roorda, University of Amsterdam, Netherlands; **Co-Author:**Rianne Bosman, University of Amsterdam, Netherlands

Previous research has shown that the affective quality of student-teacher relationships is associated with secondary school students' school engagement. However, most of these studies have used a cross-sectional design. In the present study, we therefore measured student-teacher relationship quality at the beginning, middle, and end of the school year. We used a person-centered approach to examine whether student-teacher relationships change during the course of one school year and whether these changes are the same for all students or not. Furthermore, we investigated whether the found relationship trajectories were associated with students' end of year school engagement. Secondary school students (N = 1252; 51.4% girls) reported about their relationship quality (closeness, conflict) with their Dutch and mathematics teachers at three occasions and about their behavioral and emotional engagement at the end of the school year. For closeness with both the Dutch and mathematics teacher, four relationship trajectories were found: high-stable, medium-stable, low stable, and very low-stable (for the Dutch teacher) or very low-decreasing (for the mathematics teacher). Three trajectories were found for conflict with the Dutch teacher (very low-stable, low-increasing, high-increasing) and the mathematics teacher (low-increasing, high-increasing, very high-stable). More optimal relationship trajectories (e.g., high-stable closeness, very low-stable or low-increasing conflict) were associated with higher end-of-year behavioral and emotional engagement. To conclude, secondary school students seem to differ in their relational experiences with teachers during the course of an academic school year and these different experiences have consequences for their engagement with schoolwork.

Teacher Support and Student Participation: Generalizability across Students and Subjects
Presenting Author: Simon Munk, Technical University of Munich, Germany; **Co-Author:**Ricardo Böheim, Technical University of Munich, Germany; **Co-Author:**Doris Holzberger, Technical University of Munich (TUM) & ZIB (Centre for International Student Assessment), Germany

Teacher support plays an important role in students' learning. Previous studies suggest that error culture as one facet of teacher support relates to student participation in classroom discourse. However, the question remains whether error culture is equally important for students with different learner characteristics and in different school subjects. In this contribution, we want to shed light on the generalizability of the relationship between error culture and student participation: We will examine whether the link (a) depends on students' self-concept and migration background and (b) differs across subjects. We analyze these topics with video and questionnaire data from N = 387 8^{th}-grade students in German Language Arts and Mathematics classes. Hierarchical linear models show that the role of error culture and self-concept for participation differs across school subjects. Furthermore, self-concept and migration background seem to play no significant role in the relationship between error culture and student participation. Overall results encourage teachers to strive for a positive error culture to foster student participation.

Session O 7

25 August 2023 17:00 - 18:30
UOM_A03
Symposium
Cognitive Science

Children's spatial skills: Relations to cognitive development and educational implications

Keywords: Cognitive Development, Cognitive Skills and Processes, Developmental Processes, Early Childhood Education, Mathematics/Numeracy, Problem Solving, Reasoning
Interest group: SIG 05 - Learning and Development in Early Childhood
Chairperson: Anke Maria Weber, University of Luxembourg, Luxembourg
Organiser: Anke Maria Weber, University of Luxembourg, Luxembourg
Discussant: Samuel Greiff, University of Luxembourg, Luxembourg

Spatial skills are core cognitive abilities that support representation and mental transformation of object features, such as shapes, sizes, and orientation. These skills include spatial visualization and mental rotation (mentally represent an object and imagine its rotational movement), form perception (differentiate between different shapes and symbols), and visual-spatial working memory relevant for navigation skills (Newcombe et al., 2013). Spatial skills are an essential building

block for future academic performance in the STEM fields (Uttal & Cohen, 2012). However, research on cognitive correlates, e.g., working memory, verbal abilities, problem-solving strategies, and fluid intelligence, remains sparse in young children. Moreover, our understanding of why and how children's spatial skills are associated with performance in the STEM fields is quite limited and the present symposium will make a considerable contribution.
Paper 1 examines the development of visuospatial abilities and their relation to working memory and verbal abilities in 2- to 4-year-olds. Paper 2 investigates the impact of spatial play, gender, and fluid intelligence on 5- to 6-year-olds' mental rotation. Paper 3 reports on the relation between 6- to 8-year-olds' mental rotation and their arithmetic skills, focusing on children's gender and their strategy use. Paper 4 focuses on 6- to 8-year-olds' spatial problem-solving in relation to their verbal abilities, fluid intelligence, and content knowledge.
These perspectives expand our understanding of young children's spatial skills and what cognitive correlates may influence them. Moreover, the present findings will extend and qualify previous research with respect to how research on spatial cognition may translate into educational settings.

The use of search strategy improves with age and visuospatial working memory in 2- to 4-year-olds
Presenting Author: Katarzyna Bobrowicz, University of Luxembourg, FLSHASE, Luxembourg; **Co-Author:**Anke Maria Weber, University of Luxembourg, Luxembourg; **Co-Author:**Samuel Greiff, University of Luxembourg, Luxembourg

Using spatial cues, such as shape, orientation and pattern, aids visuospatial working memory, as it allows strategies that reduce the load on working memory. One of such strategies, namely taking advantage of patterned spatial distributions, remains understudied. This strategy supports, for instance, searching for a missing item, and requires keeping track of already-searched locations and excluding them from further search, and so requires visuospatial working memory. The use of such strategies should, in principle, develop in early childhood, but, as most studies focus on chunking, the development of other strategies reducing the load on working memory is understudied in younger children. Therefore, in this study, we tested whether children between 2 and 4.5 years (N = 88) could take advantage of spatial cues in their search, and whether this ability correlated with their verbal ability and visuospatial working memory. The results showed that the ability to use a patterned spatial distribution (searching a row of locations from one side to the other instead of a random search) improved with age and visuospatial memory but did not correlate with verbal ability. These results suggest that visuospatial abilities may rapidly develop between 2 and 4 years, and given their impact on later mathematic achievement, demand increased attention in cognitive developmental research and early childhood education.

Young children's mental rotation and the relation with fluid intelligence, block play, and gender
Presenting Author: Anke Maria Weber, University of Luxembourg, Luxembourg; **Co-Author:**Katarzyna Bobrowicz, University of Luxembourg, FLSHASE, Luxembourg; **Co-Author:**Miriam Leuchter, RPTU Landau, Germany; **Co-Author:**Samuel Greiff, University of Luxembourg, Luxembourg

Spatial skills such as mental rotation are an integral part of children's cognitive development and are referred to as gatekeepers to STEM. Mental rotation emerges in children as young as 4 years of age and is malleable. However, it remains unclear when these gender differences emerge and whether intelligence is related to mental rotation in the preschool years. Additionally, finding ways to foster mental rotation might help to alleviate possible early gender differences. This study aims at contributing to this research area by investigating playful approaches to foster mental rotation in girls and boys in an experimental design with three measurement points, employing a sample of 5- to 6-year-old preschool children. In addition to this, we are interested in exploring the relation of gender and fluid intelligence with mental rotation. Thus, a playful intervention with different amounts of guidance provided by an adult (verbal + material scaffolds, material scaffolds, and free play) was employed. Results showed that mental rotation increased more in boys than in girls and that playful interventions fostered children's mental rotation. However, girls in the group with the highest guidance showed the least gains compared to all other groups, while boys profited most from this group. Girls who played freely or with little guidance showed similar increases in mental rotation as the boys. Fluid intelligence was related to mental rotation in preschool children. Play can foster mental rotation, but different amounts of guidance seem to be crucial for girls and boys.

Mental rotation and mathematics: A closer look at relations in primary school children
Presenting Author: Wenke Möhring, University of Basel, Switzerland; **Co-Author:**Léonie Moll, University of Basel, Switzerland; **Co-Author:**Marta Szewczyk, The John Paul II Catholic University of Lublin, Poland; **Co-Author:**Madga Szubielska, The John Paul II Catholic University of Lublin, Poland

Spatial and mathematical thinking are closely related. Intervention studies revealed tentative evidence for causal relations, however, potential intervening processes and differential effects remain poorly understood. In the present study, we investigated links between spatial thinking (mental rotation) and arithmetic skills in primary school children. Previous research suggested that the usage of mental strategies in mathematical computations such as decomposing a mathematical problem into a simpler problem may mediate the space-math relation (Casey et al., 2017). Thus, we assessed children's strategy use while solving arithmetic problems in addition to their mental rotation skills. Data from 6- to 8-year-olds (N = 170) revealed associations between mental rotation and arithmetic skills (r = .174, p < .05), after accounting for age, sex, fluid and verbal reasoning. A moderation analysis revealed that girls showed no relation between mental rotation and mathematics (r = .033, p = .78, n = 76), whereas the same relation was significant for boys (r = .410, p < .001, n = 94, see Fig. 1). Mediation analyses for boys revealed a significant indirect effect of mental rotation on mathematics via decomposition (95% CI [0.031; 0.441]), but no other indirect effects (see Fig. 2). The same mediation analysis for girls revealed non-significant results. These findings suggest that boys with higher spatial skills may be more inclined to use decomposition strategies which in turn is positively related to how accurately they solve mathematical problems.

Domain-general and domain-specific competencies in children's spatial problem-solving
Presenting Author: Jonas Schäfer, University Kaiserslautern-Landau (RPTU), Germany; **Co-Author:**Timo Reuter, Rheinland-Pfälzische Technische Universität Kaiserslautern - Landau, Germany; **Co-Author:**Julia Karbach, University of Koblenz-Landau, Germany; **Co-Author:**Miriam Leuchter, RPTU Landau, Germany

Problem-solving (*PS*) skills are considered crucial for children's subsequent professional and personal success and therefore are targeted in many early childhood intervention programs. However, more research is needed to understand young children's PS skills. So far, little is known about the contribution of task-specific knowledge, domain-general skills, and spatial cognition to PS abilities in 6- to 8-year-old children. In the present study, 215 children (age range: 6-8 years, M = 7.18 years, SD = 0.78) completed tests on their knowledge of building blocks' stabilities and the turning-direction and -speed of gears. Afterwards, they solved related spatial problems by stabilizing block constructions and building carousels with gears. Additionally, we measured vocabulary and figural reasoning as indicators of cognitive abilities. Data were collected on tablets by trained supervisors in one-on-one test situations. Data analyses revealed that the PS performance was significantly correlated across the different types of problems (ρ=.283 to .461). Moreover, vocabulary and figural reasoning significantly correlated with PS performance (ρ=.336 to .429). However, task-specific knowledge was significantly related to PS only in the tasks of the gear domain (ρ=.197 to .224). The results suggest that spatial PS in six- to eight-year-old children requires domain-general competencies rather than task-specific knowledge. We conclude spatial cognition to account for the domain-general competencies, which we control for by targeting explicit measures for individual spatial abilities, like mental rotation and visuospatial working memory, in a current follow-up study.

Session O 8

25 August 2023 17:00 - 18:30
AUTH_T002
Symposium
Learning and Instructional Technology

Advancing Self-Regulated Learning Research with AI: Implications from Multimodal Trace Studies

Keywords: Artificial Intelligence, Computer-assisted Learning, Educational Technologies, Emotion and Affect, Eye Tracking, Game-based Learning, Learning Strategies, Lifelong Learning, Metacognition, Self-regulated Learning and Behaviour
Interest group: SIG 27 - Online Measures of Learning Processes
Chairperson: Roger Azevedo, University of Central Florida, United States
Organiser: Maria Bannert, Germany
Discussant: Jeff Greene, United States

Self-regulated learning (SRL) is critical for learning, reasoning, problem solving, and understanding for all humans across ages, tasks, domains, and educational

contexts. Emerging interdisciplinary research on SRL has focused on using multimodal trace data to detect, measure, trace, model, and foster cognitive, affective metacognitive, motivational, and social SRL processes to understand the dynamics of these processes and their implications for learning, especially with learning technologies. The next stage of this research is to transition from descriptive analyses of the SRL processes to their use in intelligent learning technologies to provide adaptive scaffolding. Our symposium brings together four learning international research groups with extensive research experience and track record in the use and collection of SRL multimodal trace data. More specifically, the first paper focuses on emotion synchrony through regulatory triggers in collaborative learning across collaborative tasks. In the second paper, the authors measuring and understanding SRL with digital trace data with adolescents. As for the third paper, the authors investigated how real-time personalized scaffolds influence SRL processes during a complex technology task. Lastly, the authors of the fourth paper focus on analyzing log files and eye movements to examine SRL sequences during game-based learning. The authors will discuss the opportunities and challenges when considering how their methods and findings are applied to the design of AI-based technology learning environments aimed at fostering SRL across tasks and domains. Our session include Dr. Greene a leading SRL scholar who will discuss the theoretical, methodological, analytics, and AI-base educational implications of our research.

Emotional Synchrony through Regulatory Triggers in Collaborative Learning
Presenting Author: Andy (Khanh Xuan) Nguyen, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland; **Co-Author:**Yante Li, University of Oulu, Finland; **Co-Author:**Yang Liu, Univerity of Oulu, Finland; **Co-Author:**Eija Vuorenmaa, University of Oulu, Finland, Finland; **Co-Author:**Ahsen Çini, University of Oulu, Finland; **Co-Author:**Guoying Zhao, University of Oulu, Finland

Despite the importance of socially shared regulation of learning (SSRL) in collaborative learning success, there remains a paucity of evidence on how it could be detected and supported effectively. In this paper, we present an experimental study with a systematic analysis approach that utilises facial expression recognition technology to examine emotional triggers for collaborative learning regulation. The study involved high school students (N=27) working in groups of three with a collaborative learning task. During the learning process, the collaborative groups were intervened with a controlled cognitive trigger followed by three emotional triggers. AI facial expression recognition was utilised for analysing students' continuous valence and changes in emotions throughout the collaborative learning task. Cross-recurrence quantification analysis (cRQA) approach has been employed to examine emotional synchrony through regulatory triggers. Our findings present evidence for the regulatory trigger concept and offer novel insights into how the regulatory triggers facilitate emotional synchronisation among learners in collaborative learning. Furthermore, the study also demonstrates the use of AI technology for examining collaborative learning regulation. The study further discusses not only the potential role of the trigger concept in generating a better understanding of the regulatory processes but also its contribution to establishing foundations for designing support for regulation in collaborative learning.

Measuring and understanding self-regulated learning with digital trace data
Presenting Author: Joni Lämsä, University of Oulu, Finland; **Co-Author:**Susanne de Mooij, Radboud University, Netherlands; **Co-Author:**Olli Aksela, University of Oulu, Finland; **Co-Author:**Inti Bistolfi, Radboud University Nijmegen, Netherlands; **Co-Author:**Inge Molenaar, Radboud University, Netherlands; **Co-Author:**Sanna Järvelä, University of Oulu, Finland

Self-regulated learning (SRL) theory defines learning as a goal-oriented process in which students make conscious choices while working toward learning goals (Winne, 2015). Measuring complex SRL processes has been a major challenge. Fortunately, recent advancements in artificial intelligence (AI) have brought novel opportunities to enable real-time measurement of SRL processes. This presentation is embedded in a larger study focused on measuring SRL action patterns of 13—15-year-old students from five different countries when they work individually with an AI-content-related essay task in a digital learning environment (N = 200, data will be collected in November 2022—January 2023). The SRL processes are captured by trace data (navigational log, mouse, and keyboard data). We implement an existing action library using an AI-rule based system to automatically detect SRL processes from the trace data (Fan et al., 2021). We also examine how the detected SRL processes are associated with metacognitive and domain knowledge. Preliminary findings of an exploratory study (n = 21) indicate that students mostly engage in the cognitive processes (reading and writing) while the students' low utilization of the digital tools in the environment might limit the detection of the metacognitive processes (orientation, planning, monitoring, evaluation). The aggregated duration and frequency counts of the cognitive and metacognitive processes were not associated with the metacognitive and domain knowledge. In the presentation, we shed light on how AI and other data modalities could further enhance measuring, understanding, and ultimately supporting various facets of SRL.

Investigating How Real-Time Personalized Scaffolds Influence Self-Regulated Learning Processes
Presenting Author: Lyn Lim, Technical University of Munich, Germany; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany; **Co-Author:**Joep van der Graaf, Radboud University, Netherlands; **Co-Author:**Yizhou Fan, Peking University, China; **Co-Author:**Mladen Raković, Monash University, Australia; **Co-Author:**Shaveen Singh, Monash University, Australia; **Co-Author:**Inge Molenaar, Radboud University, Netherlands; **Co-Author:**Johanna Moore, University of Edinburgh, United Kingdom; **Co-Author:**Dragan Gasevic, Monash University, Australia

Scaffolding learners in self-regulated learning (SRL) has been found to improve learning outcomes. However, the effects of scaffolds can differ based on how learners use them as well as specific scaffold effects on learning processes, warranting a need for deeper and finer-grained analyses into how scaffolds influence learning. Personalized scaffolds have been proposed to be more beneficial for learning due to their adaptivity to learning progress and individualized content to learning needs. Past research has focused on SRL support which were either identical for all students or self-created by students. The current pre-post experimental study investigated personalized scaffolds based on students' real-time learning processes. Students in experimental group 1 (n = 35) received personalized scaffolds while students in experimental group 2 (n = 30) received generalized scaffolds. The control group (n = 29) learned without scaffolds. All students completed a 45-min learning task in an online learning environment with learning tools embedded. This contribution takes a closer look into how specific scaffolds influence learning processes and performance. Preliminary analyses indicated no performance differences but differences in frequencies of learning processes between groups. Process models showed temporal structures of learning processes to be similar between groups, potentially explaining no performance differences. In the presentation, further analyses will be presented discussing the finer effects of scaffolds on learning processes and their implications with respect to the development and improvement of advanced learning technologies will be discussed.

Using Multimodal Data to Examine Self-regulated Learning Sequences during Game-based Learning
Presenting Author: Daryn Dever, University of Central Florida, United States; **Co-Author:**Nathan Sonnenfeld, Univeriry of Central Florida, United States; **Co-Author:**Megan Wiedbusch, University of Central Florida, United States; **Co-Author:**Roger Azevedo, University of Central Florida, United States

While open-world learning environments, such as game-based learning environments (GBLEs), increase engagement and interest, learners must deploy self-regulated learning (SRL) strategies consistently to increase learning gains. However, most learners are unable to deploy these strategies efficiently and accurately. As such, it is important to understand how learners currently deploy SRL strategies while learning with a GBLE. This study uses both eye-tracking and log-file data to identify instances in which undergraduate students (N=56) sequentially used searching, monitoring, assembling, rehearsing, and translating (SMART) operations to engage in SRL while learning with Crystal Island, a GBLE focused on increasing microbiology knowledge. Results found that participants most frequently engaged in Searching and Assembling/Rehearsing operations followed by Monitoring and Translating operations. Transition matrices were identified for each participant to understand the probability, or likelihood, each participant sequentially transitioned between SMART operations. These probabilities were entered into multiple linear regressions to predict learning gains where results showed that the greater the likelihood participants transitioned from Monitoring to Assembling/Rehearsing, the greater their learning gains. Results theoretically indicate an importance in understanding the sequential deployment of SMART operations. Methodologically, multimodal data is essential to fully capture all SRL processes accurately. Further, educational implications support the need for GBLE elements to encourage participants' transitions between some SMART operations (i.e., Assembling/Rehearsing to Monitoring) while discouraging others (e.g., Assembling/Rehearsing to Translating).

Session O 9

25 August 2023 17:00 - 18:30
UOM_R05
Single Paper

Developmental Aspects of Instruction, Learning and Instructional Technology, Teaching and Teacher Education

Mathematics: Fractions Knowledge

Keywords: Achievement, Cognitive Development, Cognitive Skills and Processes, Computer-assisted Learning, Instructional Design, Mathematics/Numeracy, Mixed-method Research, Pre-service Teachers, Problem Solving, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Emmanuel Manalo, Kyoto University, Japan

Examining the relation between algebra and different aspects of fraction knowledge
Keywords: Achievement, Cognitive Development, Cognitive Skills and Processes, Mathematics/Numeracy
Presenting Author: Jo Van Hoof, University of Turku, Finland; **Co-Author:**Jake McMullen, University of Turku, Finland

Previously, strong relations were found between learners' fraction understanding and their algebra performance (e.g. Booth et al., 2014). However, these studies only included measures of learners' fraction size understanding, which forms a first and basic step in learners' rational number development (e.g., Van Hoof et al., 2017). Conceptual knowledge about the set of rational numbers, including the dense structure of fractions might be (even more) strongly related to algebra performance, as both require an advanced understanding of (abstract features of) number. In the present study, data from 240 Finnish secondary school students indicate that learners' algebra performance is more strongly related to their conceptual knowledge of the set of rational numbers, than to the understanding of the size of fractions. These results might contradict previous research claiming that the relation between fraction understanding and algebra performance can especially be explained by the fact that relational reasoning is needed both in rational size and algebra understanding (e.g. DeWolf et al., 2016).

Cognitive activation within a dynamic learning environment and developing a basic fraction concept
Keywords: Computer-assisted Learning, Instructional Design, Mathematics/Numeracy, Problem Solving
Presenting Author: Rowena Merkel, University of Education Freiburg, Germany; **Co-Author:**Katharina Loibl, University of Education Freiburg, Germany; **Co-Author:**Timo Leuders, University of Education Freiburg, Germany; **Co-Author:**Frank Reinhold, University of Education Freiburg, Germany

Research has shown the beneficial effect of generating multiple solutions during a problem-solving phase before subsequent instruction (*problem solving prior to instruction*, PS-I). This can be supported by visual representations that afford the use of multiple solution strategies. To support the acquisition of a conceptual understanding of fraction, a digital learning environment with dynamic fraction bars was developed in two versions (dynamic vs static visual representation). In the digital learning environment, the students acquire a first conceptual understanding of the fraction concept by comparing fractions. We investigate whether more solution strategies are generated in the dynamic learning environment than in the static environment and if this difference leads to more conceptual knowledge. In an experiment with n=92 students of grade 6, we found a descriptive trend that students in the dynamic version performed better on the posttest than the static condition; however, the difference was not significant. Furthermore, in the dynamic learning environment, the cognitive activity during the learning-phase correlated with the level achieved in the post-test. This finding indicates the relevance of the cognitive activities in a dynamic learning environment for successful learning.

Adaptive teaching with fractions: a mixed method study
Keywords: Mixed-method Research, Pre-service Teachers, Teacher Professional Development, Teaching/Instructional Strategies
Presenting Author: Sara Becker, Freiburg University of Education, Germany; **Co-Author:**Andreas Obersteiner, Technical University of Munich, Germany; **Co-Author:**Anika Dreher, Freiburg University of Education, Germany

Teachers' diagnostic competence includes the ability to notice misconceptions in student solutions and to respond adaptively to these solutions. Although adaptive teaching has often been investigated, there is a lack of content-specific research that asks whether teachers adapt their responses to student and goal focus. A mixed-methods approach was used to examine the aspects that guided pre-service teachers' responses to incorrect student solutions. The sample consisted of 50 pre-service secondary mathematics teachers. Participants' justifications for the responses were measured using vignettes presenting incorrect student solutions to fraction problems and three possible teacher responses. Participants were asked to choose the most adaptive response and to provide verbal a justification for their choice. The results show that participants' choices were guided more frequently by aspects of goal focus than by aspects of student focus. The results also indicate that participants' choices were not very adaptive because almost none of the justifications were related to aspects of student focus as well as to aspects of goal focus.

Session O 10

25 August 2023 17:00 - 18:30
UOM_A07
Single Paper
Instructional Design, Teaching and Teacher Education

Video-based Learning Activities for Teachers

Keywords: Classroom Assessment, Dialogic Pedagogy, Inclusive Education, Instructional Design, Pre-service Teachers, Science Education, Simulation-based Learning, Teacher Professional Development, Video-based Learning
Interest group: SIG 11 - Teaching and Teacher Education, SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Panagiotis Varsamis, Greece

The Power of Framing: Support Teachers to Shift to Dialogic Discourse via Mixed-Reality Simulation
Keywords: Dialogic Pedagogy, Simulation-based Learning, Teacher Professional Development, Video-based Learning
Presenting Author: Rupert Wegerif, University of Cambridge, United Kingdom; **Co-Author:**Lydia Cao, Harvard University, United States; **Co-Author:**Sara Hennessy, University of Cambridge, United Kingdom

The teacher's response, the third turn in classroom discourse, plays a vital role in creating opportunities for student sense-making and determines the quality of classroom discourse. Nonetheless, research repeatedly shows that many classroom discourses are monologic, dominated by teacher talk. Teachers' responses to students are partly driven by their framing, their sense of "what is going on in interaction", or their "sense of what activity is being engaged in". This study used a design-based research method in which researchers and teachers (of students aged 6-16) in Pakistan co-designed a professional development programme on leading productive science discussions. Notably, in this study, we incorporated mixed-reality simulations, in which teachers had the opportunity to practise dialogic teaching. One of the design features was the 'dialogic framings' embedded in mixed-reality simulation scenarios (i.e., elicitation, consolidation, and explanation discussions). We found that teachers adhered to the dialogic framings in the simulation scenarios, which led them to drastically shift their discourse patterns. We also observed that teachers transferred their learning in the simulation to their own classroom and voluntarily adopted dialogic framings during class discussions after the PD. This study showed that a macro-level shift in framing could result in a micro-level shift in teachers' discourse patterns. This finding has significant practical implications for future professional development initiatives and pre-service teacher education. Teacher educators can help teachers to recognise their own default framings and expose them to alternative dialogic framings to shift towards more dialogic discourse patterns.

Video-based Evaluations of Cognitive Activation: An Explorative Study in Science Teacher Education
Keywords: Classroom Assessment, Pre-service Teachers, Science Education, Video-based Learning
Presenting Author: Benjamin Heinitz, Leibniz University Hannover, Germany; **Co-Author:**Andreas Nehring, Gottfried Wilhelm Leibniz Universität Hannover, Germany

Cognitive activation is a central dimension of instructional quality and strong predictor for student learning gains. At the same time, video vignettes appear as a useful tool to foster teacher candidates' ability to evaluate cognitive activation in sciences classes. The purpose of this exploratory observation study was twofold: First, to investigate how cognitive activation is perceived and evaluated by teacher candidates in video vignettes. Second, to analyze if teacher education seminars based on video vignettes contribute to changes in their perception and evaluation. 21 teacher candidates from four science specific seminars were examined to evaluate the cognitive activation in two video vignettes in a written pre-post survey. Between the two data collection points, the teacher candidates visited a seminar lesson with their advisors. The seminar was focused on four predefined criteria of cognitive activation. One video vignette also served as a learning opportunity during the seminar, while the other was used as a transfer test vignette. The participants showed an increase in the overall use of criteria for cognitive activation after their seminar. However, this increase was limited to only two of the four predefined criteria and a substantial number of criteria non-related to cognitive activation was observed. We discuss these findings with regards to possible limits and requirements of using cognitive activation as a concept for science teacher candidates evaluating instructional quality.

The role of cooperative activities for differentiated instruction
Keywords: Inclusive Education, Instructional Design, Teacher Professional Development, Video-based Learning
Presenting Author: Robbert Smit, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Alexanda Taras, University of Teacher Education St.Gallen, Switzerland

Differentiated instruction is increasingly encouraged in inclusive learning settings, but there are still some difficulties with respect to the full implementation of joint learning activities in such settings. We used video clubs as a promising tool to enhance Austrian and Swiss teachers' competencies in noticing core features of their own inclusive teaching. Eight general and special-needs teachers met three times locally and once in a cross-national setting. Our qualitative research focused on patterns of frequencies and differences in the perception of inclusive education by teachers across two different school levels. A model of differentiated instruction incorporated into joint learning activities is presented, and we illustrate the model and results with an exemplary description of a joint learning lesson.

Session O 11

25 August 2023 17:00 - 18:30
UOM_A13
Single Paper
Assessment and Evaluation, Teaching and Teacher Education

Argumentation and Reasoning

Keywords: Argumentation, Assessment Methods, Competencies, Higher Education, Metacognition, Quantitative Methods, Reasoning, Science and STEM, Secondary Education, Teacher Effectiveness, Teacher Professional Development, Teaching/Instructional Strategies, Writing/Literacy
Interest group: SIG 11 - Teaching and Teacher Education, SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Monika Nerland, University of Oslo, Norway

Students' use of connectives in argumentative writing – Which aspects of family background matter?
Keywords: Competencies, Quantitative Methods, Secondary Education, Writing/Literacy
Presenting Author: Elisabeth Mundt, University of Kassel, Germany; **Co-Author:**Madeleine Domenech, University of Kassel, Germany

As a central element of academic language competence, knowledge of connectives has proven relevant for learning. However, it is still unclear which roles distinct aspects of family background play regarding the formation of students' language competences. This study strives to further clarify this aspect. We use data of $N = 1005$ grade 5 students and their parents, who took part in the FUnDuS project in Germany. The questionnaires on the family background assessed the parents' education, the HISEI, home possessions related to family wealth, number of books at home, parents' aspirations concerning their children's education, migration background, and family language use. In addition, students completed a nonverbal cognitive abilities test and wrote persuasive letters. These texts were rated with regard to the number and diversity of argumentative connectives used as well as their length. Controlling for students' general cognitive abilities, partial correlations showed no relations between the use of connectives and parental education, HISEI, or home possessions, but with the number of books and parental aspirations. Furthermore, migration background was associated with less connectives, but family language was not linked to students' use of connectives. Interestingly, text length was related with all the indicators of students' socio-economic background, but neither with migration background nor family language use. Thus, our findings add to the evidence negating the impact of family language use on students' language competences but point towards the significance of socio-economic aspects, in particular, "soft" factors like parents' educational aspirations for their children.

Measuring students' argumentation skills: validation of a test instrument
Keywords: Argumentation, Assessment Methods, Higher Education, Quantitative Methods
Presenting Author: Yvonne Berkle, University of Koblenz - Landau, Germany; **Co-Author:**Andreas Janson, University of Kassel, Germany; **Co-Author:**Thiemo Wambsganß, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland; **Co-Author:**Denise Löfflad, University of Kassel, Germany; **Co-Author:**Jan Marco Leimeister, University of Kassel, Germany; **Co-Author:**Miriam Leuchter, RPTU Landau, Germany

The importance of argumentation skills for academic disciplines is well evident. Two core aspects of argumentation skills are a) the recognition of argumentation fallacies and b) the recognition of the structure of arguments. These two argumentation skills might be related to domain-specific knowledge. In our study, we aim to evaluate an instrument to assess the recognition of argumentation fallacies and the structure of arguments in the context of different domains. Thus, we implemented a self-developed instrument to measure both argumentation skills in different student groups (business economic students and pre-service teachers) in different domains: a) the study-domain of their own courses, b) the study-domain of the respective other courses and c) a neutral domain (sustainability). We assumed these three domains to represent different dimensions within the ability to recognize argumentation fallacies and within the ability to recognize argument structures. This assumption could not be confirmed, what leads to the assumption that our instrument captures cross-domain argumentation skills. However, our research implies a difference in the recognition of formal compared to informal argumentation fallacies. Furthermore, the results indicate that the instrument measures argumentative skills in both groups of students equally well.

Noticing Confirmation Bias and Emphasizing Scientific Reasoning During Modeling
Keywords: Metacognition, Science and STEM, Teacher Professional Development, Teaching/Instructional Strategies
Presenting Author: Amanda Cottone, University of Pennsylvania, United States; **Co-Author:**Susan Yoon, University of Pennsylvania, United States; **Co-Author:**Clark Chinn, Rutgers University, United States; **Co-Author:**Noora Noushad, University of Pennsylvania, United States; **Co-Author:**Huma Hussain-Abidi, Rutgers University Graduate School of Education, United States; **Co-Author:**Thomas Richman, University of Pennsylvania, United States

Confirmation bias is one reason for the spread of misinformation among the public and this necessitates that science teachers shift focus towards promoting students' use of reliable scientific reasoning strategies (in addition to content knowledge) during instruction. To better understand how best to support teachers in this shift, we engaged 14 high school biology teachers in a professional development (PD) activity that prompted them to evaluate the strategies students used while engaging in scientific modeling and reflect on ways to promote their students' scientific reasoning. Our findings demonstrate that teachers varied widely in their identification of some of the hallmarks of confirmation bias in students' reasoning and that time constraints and the ability to make students' thinking visible often interfere with their ability to redress such biases. This study can contribute to our understanding of effective ways to support teachers in improving their identification of confirmation bias and then creating learning opportunities needed to redress it during class.

The Multiplicity, Adaptability, and Orientation of Teachers' Noticing of Proof-related Reasoning
Keywords: Reasoning, Teacher Effectiveness, Teacher Professional Development, Teaching/Instructional Strategies
Presenting Author: Mei Yang, University of Cambridge, China

Research on teacher noticing can help us unpack the perceptual and cognitive processes underlining teachers' in-the-moment decisions, but this construct is seldom studied in the area of teaching proving. Taking a small unit of analysis (i.e., looking at the moments teachers noticed each student argument), this study aimed to investigate in what ways teachers notice students' reasoning in the context of a proving activity, and what evident patterns existed in their ways of noticing. Twelve Chinese pre-service and in-service secondary mathematics teachers participated in a semi-structured, vignette-based interview where they were presented with realistic classroom scenarios. Based on the interview results, teachers' different ways of paying attention to, interpreting, and deciding how to respond to students' proof-related reasoning were characterized. Three evident patterns of teacher noticing were identified to capture ways of teacher noticing. It was found that individual teachers' ways of noticing were multiple and adaptive at any moment, and they worked internally consistently to drive individual teachers' noticing of the whole proving activity. These findings made a theoretical contribution to our understanding of both the dynamic and situational nature of teacher noticing and the potential relationships between teacher noticing at different grain sizes. To better understand and enhance teacher noticing and subsequently teaching practice, future research and training on teacher noticing can take into account the multiplicity, adaptability, and orientation of teacher noticing.

Session O 12

25 August 2023 17:00 - 18:30
AUTH_TE2
Single Paper
Higher Education, Learning and Instructional Technology, Teaching and Teacher Education

Teachers' Digital Literacy and Learning

Keywords: Attitudes and Beliefs, Digital Literacy and Learning, Educational Technologies, Engineering Education, Higher Education, Instructional Design, Primary Education, Qualitative Methods, Secondary Education, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Ilona Friso-van den Bos, University of Twente, Netherlands

Didactical Design Dice - a meta-knowledge framework for (re)designing technology-mediated education
Keywords: Digital Literacy and Learning, Instructional Design, Teacher Professional Development, Teaching/Instructional Strategies
Presenting Author: Sylvana Sofkova Hashemi, University of Gothenburg, Sweden; **Co-Author:**Maria Spante, School of Business, Economics and IT Division of Informatics, Sweden

The aim of this study is to investigate and critically discuss the orchestration of opportunities for equal participation in learning in technology-mediated situations when using a meta- knowledge framework. The study is situated in a newly built school providing flexible access to variations of rooms, furniture and digital resources. We focus on teacher teams' design conducted in workshops applying the Design Dice model. The analysis is based on data from workshop-driven activities, lesson observations, and focus group interviews with five teacher teams of totally 26 teachers. The findings demonstrate that the teacher teams' design requires flexibility in the planning process and approaching student-driven choices in a meta-structure for students to participate and learn. Teaching required extensive collective planning to uphold the shared design throughout the spaces, activities, and resources. The Design Dice model helped to create a tool for obtaining common ground in the teacher teams' negotiations when designing for learning. However, there is reason to believe that in some situations the model becomes too static rather than the creative support as this study showed. Future studies are therefore needed to investigate the restricting part of the Design Dice model.

Digital multimodal teaching and assessment: developing teachers' knowledge and competence
Keywords: Digital Literacy and Learning, Primary Education, Qualitative Methods, Teacher Professional Development
Presenting Author: Sylvana Sofkova Hashemi, University of Gothenburg, Sweden; **Co-Author:**Petra Magnusson, Kristianstad University, Sweden

This paper presents initial findings from an ongoing research project, Teachers' meta knowledge and assessment practices in digital, multimodal learning environments (2022-2024). The project is grounded in multimodal social semiotics (Kress, 2010), didactic design theoretical perspective (Selander, 2022; Sofkova Hashemi & Spante, 2016; Åkerfeldt, 2014) and Design Based Research (DBR) (Anderson & Shattuck, 2012). The project explores and develops teachers' digital multimodal teaching and assessment in compulsory schools. This paper concentrates on the first iteration of three, which aims to increase teachers' knowledge and competence regarding how meaning-making, with different modes and digital learning resources, can be used and articulated in lesson activities and acknowledged in students' work. Nineteen teacher teams from two schools participated in a workshop and designed their lesson through a tool set up by the researchers. The tool addressed six areas 1) Knowledge content, 2) Skills, 3) Timeframe, 4) Space, 5) Resources, and 6) Reflection regarding knowledge and skills. The empirical material consists of these lesson plans, workshops, focus group interviews with teachers and observations. The empirical material was analysed from a design-oriented multimodal social-semiotic perspective focused on framing, functional load, and meaning potential (Kress, 2010; Selander, 2022). The findings showed three emerging themes: discrepancy in focus between content and form, lack of explicit recognition of students' digital competence and weak framing in the planned teaching with digital learning resources.

Remote digital assessment – variations in teachers' experiences
Keywords: Educational Technologies, Engineering Education, Higher Education, Teacher Professional Development
Presenting Author: Ida Naimi-Akbar, KTH Royal Institute of Technology, Sweden

In this phenomenographic research, engineering teachers' different ways of experiencing the transition of assessment to remote digital settings during the COVID-19- pandemic are investigated. Transition to remote assessments was experienced in three different ways: as an external concern, as an adjustment and as changed conditions for students learning. Different ways of experiencing assessment will likely have different consequences for how the assessment practice is enacted and what and how students learn. The findings indicate that if digitalisation contributes to better support for students' learning, as often argued, teachers' conceptions and ideas about assessments in remote settings need to be developed and problematised.

The discrepancy in the technology integration: teachers seek short-term, students long-term goals
Keywords: Attitudes and Beliefs, Educational Technologies, Qualitative Methods, Secondary Education
Presenting Author: Doris Kristina Raave, University of Tartu, Estonia; **Co-Author:**Eric Roldan Roa, Center for Scalable Data Analytics and Artificial Intelligence, Germany; **Co-Author:**Margus Pedaste, University of Tartu, Estonia; **Co-Author:**Katrin Saks, University of Tartu, Estonia

The integration of digital technology into the teaching-learning processes is a characteristic of contemporary education, made even more prominent due to the COVID-19 pandemic. The prevalent use of digital technology implies it beneficiary for teaching and learning. However, research on how digital technology benefits learning and the reasons behind the integration of digital technology is scarce. Further, one underlying question is whether these reasons are congruent by both stakeholders of the teaching-learning processes, teachers and students, to implement and reflect on meaningful digital technology integration that effectively supports achieving desired learning goals.
This study aims to get a preliminary understanding of teachers' and students' reasoning for digital technology integration in the learning process. To do this, we conducted semi-structured interviews with K–12 teachers and their students to understand why they integrate digital technology into the teaching-learning process. We found that teachers were mainly guided by short-term learning strategies such as practicality and engagement, whilst students sought a long-term goal of improvement in learning by deeper understanding. This finding indicates a discrepancy between teachers' and students' reasons for digital technology integration, possibly contributing to students' distancing from the teacher-led learning process and, thus, also to its limited effect on students' learning outcomes. To tackle this discrepancy, support more student-centred teaching-learning processes and achieve desired learning outcomes, we suggest giving students more voice and choice in how digital technology is integrated to promote their self-determination, agency and ownership in the learning process.

Session O 13

25 August 2023 17:00 - 18:30
UOM_R08
Single Paper
Teaching and Teacher Education

Teacher Professional Development

Keywords: Competencies, E-learning/ Online Learning, Emotion and Affect, Inclusive Education, Learning Approaches, Mathematics/Numeracy, Motivation, Pre-service Teachers, Primary Education, Quantitative Methods, Science Education, Teacher Effectiveness, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Ana Paula S. Loures-Elias, Portugal

Teachers' profiles of content knowledge, motivational and emotional orientations in statistics
Keywords: Competencies, Mathematics/Numeracy, Quantitative Methods, Teacher Professional Development
Presenting Author: Sarah Huber, Technical University of Munich, Germany; **Co-Author:**Frank Reinhold, University of Education Freiburg, Germany; **Co-Author:**Andreas Obersteiner, Technical University of Munich, Germany; **Co-Author:**Kristina Reiss, Technische Universität München (TUM), Germany

Teachers' professional competence includes both their affective and cognitive aspects. Investigating these aspects is important as they are related to student achievement. In the field of statistics, however, research on teachers' professional competence is sparse. Since previous studies yielded contradictory results regarding the relationship between teachers' cognitive and affective aspects, it stands to reason that there are groups of teachers with atypical competence profiles, such as teachers with low content knowledge but high motivational and emotional orientations. Identifying such competence profiles could contribute to more targeted teacher education programs. Therefore, we surveyed $N = 87$ in-service mathematics teachers about their self-efficacy, anxiety, and joy regarding teaching statistics and tested their statistical content knowledge. Using this data, we conducted a cluster analysis, which revealed three different competence profiles: Cluster (1) included teachers who tended to overestimate their statistical knowledge. They should be better aware of their knowledge gaps. Cluster (2) included teachers with comparatively high content knowledge and rather positive orientations. They could need support with advanced statistical concepts or instructional strategies. Cluster (3) included teachers who showed moderate orientations and low content knowledge. Improving their knowledge by teacher development programs might improve also their orientations. The clusters found provide a possible explanation for the contradictory results regarding the relationship between cognitive and affective aspects in statistics, thus adding value to research on teachers' professional competence. The findings are in particular relevant for the further development of teacher education: Courses should be designed to adaptively support teachers with different competence profiles.

Efficacy of induction elements on the development of beginning teachers' qualities
Keywords: Emotion and Affect, Motivation, Teacher Effectiveness, Teacher Professional Development
Presenting Author: Xiangyuan Feng, University of Groningen, Netherlands; **Co-Author:**Michelle Helms-Lorenz, University of Groningen, Netherlands; **Co-Author:**Ridwan Maulana, GION - University of Groningen, Netherlands

The present study examined how the quantity and quality of induction elements and element configurations explain the development of beginning teachers' quality over the first two career years. Teacher quality is studied as an integral framework that covers both motivational-affective (i.e., endowed professional value, affection for teaching and the subject, self-efficacy for instruction, classroom management, and student engagement) and teaching behavioural aspects (i.e., Learning Climate, Classroom management, Instructional Clarity, Activating Teaching, Differentiated Instruction, and Teaching Learning Strategies). This study accounts for the potential impact of teacher-level characteristics and group heterogeneity. 280 Dutch beginning teachers were surveyed at three waves. The study reveals that the quantity of induction elements (rather than the quality of elements, program length, or program quality) has superior explanatory power for the changes in beginning teachers' quality, especially when group heterogeneity of beginning teachers is taken into account. The direction and strength of induction elements vary across teacher subgroups and different aspects of teacher quality. The findings unravel the complexity of induction evaluation that is often simplified in previous research, signifying the need to elaborate on the properties of induction, contexts, and teachers.

Teachers' awareness of the generalising potential of school assignments
Keywords: Inclusive Education, Primary Education, Science Education, Teacher Professional Development
Presenting Author: Birgit Vogt, University of Koblenz, Germany; **Co-Author:**Markus Linnemann, University of Koblenz, Germany

One of the functions of academic language is generalising (Feilke, 2012). In the context of educational language functions, generalising is a prerequisite for cognition and communication of cognition. It is thus a central variable for educational research, nonetheless generalising has received little attention so far, despite its role as a key skill. Generalisation processes, such as analysing and evaluating in Bloom's taxonomy of learning (Anderson & Krathwohl, 2001), are at the core of cognitively activating teaching. A closely related operation to generalising is categorising. Cognitive categories are products of the interaction of structures in the world and information-processing systems (Müsseler & Rieger, 2017) and thus a central aspect of human information processing. The question arises whether teachers recognise inherent potential for generalising in tasks despite the underrepresentation of generalising in educational research and how it is taken into account in the course of inclusive lesson planning. First results make clear that an existing potential for the promotion of generalising as a target competence is seen only to a small extent. Only about 14% of the teachers surveyed recognised the generalisation potential of suitable tasks. Particularly in inclusive teaching, further weaknesses become apparent: 18% of the teachers stated that tasks that lend themselves to generalisation are withheld from learners with special needs. Overall, it became clear that there is a need to create a greater awareness of using tasks for generalisation.In the presentation, the construct, study and results will be presented and discussed against this background.

A positive impact of a PBL-based online course: A multidimensional model of identity construction
Keywords: E-learning/ Online Learning, Learning Approaches, Pre-service Teachers, Science Education
Presenting Author: Yulia Muchnik-Rozanov, Technion - Israel Institute of Technology, Achva Academic College, Israel; **Co-Author:**Dina Tsybulsky, Technion - Israel Institute of Technology, Israel

This study demonstrates that the online project-based learning course, designed as a pedagogy of practice, tends to be positively linked to developing preservice teachers' professional identity. The linguistic and content analyses revealed that the construction of professional identity was manifested through six motifs: Self-confidence, self-agency, sense of belonging, self-awareness, autonomy, and envisioning a future teaching self. Each of the motifs was portrayed with its characteristic set of time-oriented types of discourse (i.e., using past, present, and future tenses while describing feelings and thoughts regarding one's teaching self.) Based on the findings, we introduce a multidimensional model that explains identity construction as the intersection between the dimensions of identity and the temporal dimensions of reflective discourse.

Session O 14

25 August 2023 17:00 - 18:30
AUTH_T202
Single Paper
Cognitive Science, Learning and Instructional Technology, Learning and Special Education

Reading: Cognitive Processes and Skills

Keywords: Achievement, At-risk Students, Cognitive Skills and Processes, Comprehension of Text and Graphics, Digital Literacy and Learning, Primary Education, Reading, Resilience, Secondary Education, Writing/Literacy
Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 15 - Special Educational Needs
Chairperson: Marielle Wittelings, Behavioural Science Institute, Radboud University Nijmegen, Netherlands

Reading from Paper, Computers, and Tablets in First Grade: The Role of Comprehension Monitoring
Keywords: Comprehension of Text and Graphics, Digital Literacy and Learning, Primary Education, Reading
Presenting Author: Elena Florit, University of Verona, Italy; **Co-Author:**Pietro De Carli, University of Milano-Bicocca, Italy; **Co-Author:**Kate Cain, Lancaster University, United Kingdom; **Co-Author:**Lucia Mason, University of Padova, Italy

Recent meta-analyses indicate the inferiority of reading from a screen (i.e., mainly computer screen), compared to paper-based reading of informational texts, among undergraduates and high school students. Meta-analyses also suggest that the screen inferiority for text comprehension may be linked to individual differences in metacognition. This study focuses on beginner readers to investigate whether the inferiority of screen-based reading for informational texts emerges in beginner readers and includes screen-reading from both computers and hand-held devices, and the influence of comprehension monitoring skills. Participants were 58 first graders (35 F; M_{age} = 6.8 years). Text comprehension at the level of the main idea, literal and inferential information was assessed using six texts; one narrative and one informational text (i.e., descriptive text) on each of paper, laptop, and tablet. Comprehension monitoring was assessed through an inconsistency detection task in which children were required to identify inconsistent sentences in texts. A standardized measure of reading comprehension was included as a control. Main results from mixed models showed the superiority of main idea and literal comprehension for descriptive texts presented on tablets and the superiority of inferential comprehension for narrative texts. Comprehension monitoring uniquely accounted for main idea and literal comprehension independently of medium and text genre and had a greater effect on descriptive than narrative text comprehension at the inferential level. Overall, these findings inform educational practices by showing that the screen inferiority effect is not detected in beginner readers' text comprehension. The latter is supported by metacognition, independently of the medium.

Reciprocal relations between morphological awareness and literacy among Greek Cypriot children
Keywords: Achievement, Primary Education, Reading, Writing/Literacy
Presenting Author: Evdokia Pittas, University of Nicosia, Cyprus; **Co-Author:**Terezinha Nunes, University of Oxford, United Kingdom

There is considerable support for the contribution of morphological awareness to reading and spelling in different orthographies, but few studies have examined the reverse connection: whether experience in reading and spelling helps children to develop morphological awareness. The aim of this longitudinal study was to examine whether morphological awareness and literacy reciprocally influence each other. Participants (N=404) were children, 6 to 9 years at the start of the project, who learn literacy in Cyprus using Standard Modern Greek (SMG). Because there are no standardised measures of morphological awareness in SMG, measures were developed during a pilot study and their internal consistency was assessed. A stringent analysis was carried out controlling for the effects of the outcome measure at Time 1 (auto-regressor). The cross-lagged partial correlation between morphological awareness at T1 and reading and spelling at Time 2, controlling for the auto-regressor, was significant. The same was true when the outcome measure was morphological awareness: Time 1 reading and spelling correlated significantly with morphological awareness at Time 2 even after controlling for morphological awareness at Time 1. Thus, the better the children's morphological awareness, the better they learn to read and spell; also, the more experience children have with reading and spelling, the more their morphological awareness develops. By establishing the plausibility of a causal and reciprocal link between morphological awareness and literacy, this study makes theoretical and empirical contributions to understanding the reciprocal relation between morphological awareness and literacy. This relation should be tested in further research using intervention methods.

The role of task models and goal management in 6th graders' online reading strategies.
Keywords: Cognitive Skills and Processes, Comprehension of Text and Graphics, Reading, Secondary Education
Presenting Author: Jean-Francois Rouet, University of Poitiers, France; **Co-Author:**Yann Dyoniziak, CeRCA UMR7295 Université de poitiers, France; **Co-Author:**Mônica Macedo-Rouet, CY Cergy Paris Université, France; **Co-Author:**Émilie Dujardin, Université de Poitiers, France; **Co-Author:**Anna Potocki, Université Grenoble Alpes, France

Reading to learn requires secondary school students to correctly interpret their assigned reading task demands (i.e., an accurate task model) as they engage with the materials. We examined the contribution of sixth graders' task models and strategy knowledge on their literal and inferential comprehension of texts varying in length and complexity. Participants were assigned 9 computerized reading comprehension tasks, a strategy knowledge questionnaire, a word reading test and a reading self-concept inventory. Structural equation models were to be used in order to assess the specific contribution of students' task model accuracy to comprehension performance, controlling for word reading and reading self-concept.

Compensation in children with (a risk of) reading difficulties: A scoping review
Keywords: At-risk Students, Primary Education, Reading, Resilience
Presenting Author: Sanne Appels, University Utrecht, Netherlands; **Co-Author:**Sietske van Viersen, Utrecht University, Netherlands; **Co-Author:**Lisette Hornstra, Utrecht University, Netherlands; **Co-Author:**Sara van Erp, Utrecht University, Netherlands; **Co-Author:**Elise de Bree, Utrecht University, Netherlands

This scoping review aims to systematically review empirical evidence for specific protective, skill-enhancing and promotive factors involved in compensation of literacy difficulties in children (aged 6-16) with (a risk of) reading difficulties (RD). While there has been ample attention for identifying risk factors in the field of RD and dyslexia, much less research has focused on resilient trajectories in atypical literacy acquisition. In this scoping review, we examine which evidence for compensatory factors has been found in studies taking either a variable-centered approach or a person-centered approach. The five phases of the methodological framework of Arksey and O'Malley (2005), extended by Levac et al. (2010), were followed: a) specifying the research question; b) identifying relevant studies; c) selecting studies; d) charting the data; and e) collating, summarizing, and reporting the results. Twenty-nine studies were included in which children with (a risk of) reading difficulties were studied on relevant reading and spelling measures (e.g. word-reading accuracy or fluency, text-reading fluency, reading comprehension, and/or word-level spelling), and in which there was a focus on protective, skill-enhancing and/or promotive factors. This scoping review highlights the lack of empirical evidence on compensatory factors behind resilience in literacy acquisition.

Session O 15

25 August 2023 17:00 - 18:30
AUTH_DC1
Single Paper
Motivational, Social and Affective Processes, Teaching and Teacher Education

Teachers' Job Satisfaction and Well-being

Keywords: Burnout, Emotion and Affect, Engagement, In-service Teachers, Meta-analysis, Motivation, Secondary Education, Social Aspects of Learning and Teaching, Teacher Effectiveness, Well-being
Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education
Chairperson: Nienke Smit, Utrecht University, Netherlands

Satisfied and High Performing? A Meta-Analysis on the Correlates of Teachers' Job Satisfaction
Keywords: Meta-analysis, Motivation, Teacher Effectiveness, Well-being
Presenting Author: Gyde Wartenberg, IPN - Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Karen Aldrup, IPN – Leibniz Institute for Science and Mathematics Education, Kiel, Germany; **Co-Author:**Simon Grund, University of Hamburg, Germany; **Co-Author:**Uta Klusmann, IPN – Leibniz Institute for Science and Mathematics Education, Kiel, Germany

This meta-analysis examines the relationship between teachers' job satisfaction and teachers' professional performance. Job satisfaction represents a key indicator of occupational well-being and describes the cognitive evaluation of ones' job likely resulting in a positive affect. As such, job satisfaction is negatively associated with turnover intentions and absenteeism. Established theoretical models propose that job satisfaction enhances professional performance through both a cognitive-driven and affective-driven pathway (Weiss, 2002). Accordingly, teachers evaluating their job as positive likely invest more resources in lesson

planning and teacher-student interactions (Siegrist, 2002). Additionally, due to the positive affect that is associated with job satisfaction, satisfied teachers can fall back on an extended thought-action repertoire (Fredrickson, 2001), enabling teachers to react more flexible to students educational, emotional and social needs. A comprehensive literature search in PsychINFO, Web of Science, and Open Grey yielded a total of 856 records, of which 91 were included in the present study. Meta-analyses using random-effects models demonstrated small to moderate positive associations between teachers' job satisfaction and teacher-student interactions, student motivation, and achievement, while turnover intentions and absenteeism were negatively related to job satisfaction. Meta-regressions showed that the positive associations between teachers' job satisfaction, the quality of teacher-student interactions, and student motivation were stronger when teachers reported on the outcomes. Based on the meta-analytic summary of different consequences of teachers' job satisfaction, we aim to identify areas where empirical findings are lacking, set an agenda for future research, and discuss implications for the importance of facilitating teachers' professional well-being.

Teachers' Occupational Well-Being in Relation to Teacher–Student Interactions
Keywords: Burnout, Engagement, Secondary Education, Social Aspects of Learning and Teaching
Presenting Author: Sze Wah Chan, Universtiy of Jyväskylä, Finland; **Co-Author:**Sanni Pöysä, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland; **Co-Author:**Eija Pakarinen, University of Jyväskylä, Finland

Teachers' occupational well-being is critical for their teaching quality as well as for students' learning. Review shows that knowledge about the relations of observed classroom interactions with positive occupational well-being particularly in the secondary education context is scarce. The present study aims to fill in such literature gaps by investigating the roles of both positive and negative aspects of occupational well-being and its relation towards all domains of observed classroom interactions quality, in the lower secondary school level. Subject teachers (N = 48) rated their occupational well-being in terms of engagement, stress, job demands, and emotional exhaustion. Teacher–student interactions in classrooms were video-recorded and coded with the Classroom Assessment Scoring System–Secondary (CLASS–S) measure (Pianta et al., 2012). The results of multivariate regression analyses showed that teachers who reported higher work-related stress were observed with a lower quality of emotional support, classroom organization, and instructional support when controlling for background factors. The results suggest that the observed quality of teacher–student interactions is related to teachers' work-related stress in lower secondary schools. The results also provide insights that teachers' occupational stress and possibly also emotional engagement could relate differently to the three domains of teacher–student interactions.

Investigating the interplay of teachers' emotions, subjective well-being, and daily work situations
Keywords: Burnout, Emotion and Affect, In-service Teachers, Well-being
Presenting Author: Tanja Bross, Augsburg University, Germany; **Co-Author:**Ulrike Nett, Augsburg University, Germany

In their daily work life, teachers are experiencing various emotions. These emotions fluctuate during the day and are closely linked to aspects such as subjective well-being. A possible factor that influences the variation of emotions are context variables. Previous research mainly investigated these context variables by capturing challenging situations experienced by teachers and their impact on general outcomes like subjective well-being. However, these studies neglected the role of distinct emotions. The aim of the present study was to investigate emotions experienced in these situations, linkages with subjective well-being and possible moderating effects of challenging situations. In total, 168 teachers participated in a diary study during sixteen consecutive days. The findings of our study hint to the relevance of the emotions experienced in challenging situations. Our results highlight the role of emotions and their interplay with challenging situations as well as subjective well-being. On an educational level, teachers should be supported to deal with challenging situations and the emotions arising in these situations.

Session O 16

25 August 2023 17:00 - 18:30
UOM_A08
Single Paper
Higher Education, Learning and Instructional Technology, Motivational, Social and Affective Processes

Self-regulated Learning and Behaviour

Keywords: Achievement, Computer-assisted Learning, Educational Technologies, Emotion and Affect, Engagement, Higher Education, Learning Approaches, Learning Strategies, Metacognition, Motivation, Self-regulated Learning and Behaviour
Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Sabrina Gerth, Austria

Student engagement and self-regulation in adolescence: A within-person reciprocal relation
Keywords: Engagement, Metacognition, Motivation, Self-regulated Learning and Behaviour
Presenting Author: Kristján Ketill Stefánsson, University of Iceland, Iceland; **Co-Author:**Steinunn Gestsdóttir, University of Iceland, Iceland; **Co-Author:**Freyja Birgisdottir, University of Iceland, Iceland

Drawing on recent scholarly work on the positive synergy between engagement and motivation (see Skinner & Raine, 2022), a reciprocal relation between student engagement and intentional self-regulation (ISR) in adolescence would be expected. However, previous research has been limited to between-person models to test the reciprocal relation between student engagement and ISR. We thus reanalyzed data previously used by Stefansson et al. (2018). The sample consisted of 561 adolescent students in Iceland (46% girls; Mage at Wave 1 = 14.3 years; SD = 0.3) and four waves of data collected during Grades 9 and 10. Using the random-intercept cross-lagged panel model (RI-CLPM; see Mulder & Hamaker, 2021), the results demonstrated a moderate (β = .17 - .41) within-person reciprocal relation between school engagement and ISR after controlling for several covariates (e.g., academic achievement). The cross-lagged effects observed using the RI-CLPM showed a similar pattern to the cross-lagged effects previously observed using the traditional CLPM (see Stefansson et al., 2018). However, the cross-lagged effect sizes were nearly twice as strong using the RI-CLPM. The results highlight the importance of considering both student engagement and intentional self-regulation when designing optimal learning environments for adolescents.

"Don't Chat in Class!": Self-regulated School Engagement Profiles and Academic Achievement
Keywords: Achievement, Emotion and Affect, Engagement, Self-regulated Learning and Behaviour
Presenting Author: Ioannis Katsantonis, University of Cambridge, United Kingdom

Students' self-regulation goes hand-in-hand with school engagement in predicting academic achievement and competence. Yet, the question remains whether different profiles of behavioural and affective self-regulated school engagement exist that differentially influence students' academic achievement. Hence, the present study aimed to address this evidence gap. The data came from 13,847 British primary school students (age *M*=7.24, *SD*=.25), who participated in the *Millennium Cohort Study*. Latent profile analysis revealed four profiles of students' behavioural and affective self-regulatory skills and engagement. 63.7% of the students were classified as *highly self-regulated engaged*, whereas 29.97% were *slightly dysregulated and disengaged*. 1.86% of the students were classified as *dysregulated but engaged*, whilst 4.43% were *disengaged and dysregulated*. Having denominated the profiles, the BCH method was deployed to explore differences across profiles in standardised maths and reading achievement. In short, the findings illustrated that the majority of primary school students, who had acquired good self-regulatory skills and were highly engaged, had the highest scores in maths and reading. Students with incompatible levels of self-regulation and school engagement had the lowest scores in maths and reading across all profiles. The analyses underscored that students need to develop not only high levels of emotional and behavioural self-regulation but also high levels of behavioural and emotional school engagement in order to be academically flourishing. Finally, the results indicate that early emotional and behavioural self-regulatory skills training is necessary in pre-primary education since good self-regulatory skills were connected to higher behavioural and affective engagement, and achievement.

The Effect of Generalised and Personalised Scaffolds on Self-Regulated Learning

Keywords: Computer-assisted Learning, Educational Technologies, Higher Education, Self-regulated Learning and Behaviour
Presenting Author: Joep van der Graaf, Radboud University Nijmegen, Netherlands; **Co-Author:**Lyn Lim, Technical University of Munich, Germany; **Co-Author:**Yizhou Fan, Peking University, China; **Co-Author:**Shaveen Singh, Monash University, Australia; **Co-Author:**Mladen Raković, Monash University, Australia; **Co-Author:**Johanna Moore, University of Edinburgh, United Kingdom; **Co-Author:**Dragan Gasavic, Monash University, Australia; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands

Self-Regulated Learning (SRL), also called “Learning to learn”, is important to master for lifelong learning. SRL is executing cognitive and metacognitive processes in order to attain learning goals. Students struggle with SRL, but scaffolds can help. However, scaffolds often are not based on a learner’s actual learning process. Therefore, the present study investigated the effect of generalised and personalised scaffolds on learners’ SRL processes, their learning outcomes, and the association between those. University students were assigned to one of three conditions (control, generalised, or personalised) and performed a writing task. We measured their domain-specific knowledge, SRL processes, and essay scores. Results showed similar learning gains in all conditions and higher essay scores in the personalised compared to the control condition. Furthermore, frequencies of four SRL processes were higher in the scaffold conditions. Condition did not moderate the relation between SRL processes and essay scores, with the exception of high cognition. The control condition showed a negative and the generalised condition a positive relation. To conclude, the personalised scaffolds were effective, as the essays were of better quality. Furthermore, results suggest that our personalised scaffolds were indeed personal, as the relation between SRL and learning outcome did not change.

Approaches to learning and self-regulation strategies among Chilean higher education students
Keywords: Higher Education, Learning Approaches, Learning Strategies, Self-regulated Learning and Behaviour
Presenting Author: Carlos González, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Juan Pedro Ross, Universidad de Chile, Chile

This study aims to deepen our understanding of the relationship between SAL, SR, and learning strategies. A sample of 9045 students from 10 HEIs, representing the diverse nature of Chilean higher education, participated. The correlations among approaches to learning scales are in line with previous research. Also, as expected, the deep approach and organized study scales present positive associations with self-regulation and learning strategies and negative ones with the unreflective approach. Latent profile analysis yielded three students’ profiles. The first one represents a group of unreflective students with low self-regulation who applied poor learning strategies (n = 1806; 20% of the sample). The second is a group of deeply strategic students with high self-regulation who applied good learning strategies (n = 2666, 29%). The third group, near-average students, is a group presenting an overall average deployment of approaches to learning, self-regulation, and learning strategies (n = 4573, 51%). Chi-squared tests show that only the unreflective and deep-strategic groups present differences among characterization variables. The average group has no significant differences among any of them. Results are relevant for HEIs in Chile, where evidence is key to understanding and supporting students' learning processes in the context of universal access to higher education.

Session O 17

25 August 2023 17:00 - 18:30
AUTH_T102
Single Paper
Cognitive Science

Conceptual Change and Epistemic Beliefs

Keywords: Assessment Methods, Attitudes and Beliefs, Cognitive Skills and Processes, Conceptual Change, Higher Education, Knowledge Construction, Misconceptions, Personality, Quantitative Methods, Science Education, Secondary Education, Synergies between Learning / Teaching and Research
Interest group: SIG 03 - Conceptual Change
Chairperson: Fotini Polychroni, National and Kapodistrian University of Athens, Greece

Relation of conceptual understanding and epistemic beliefs in biology: A person oriented approach
Keywords: Conceptual Change, Misconceptions, Science Education, Secondary Education
Presenting Author: Vesta Aleknavičiūtė, Vytautas Magnus University, Lithuania; **Co-Author:**Ilona Södervik, University of Helsinki, Finland; **Co-Author:**Erno Lehtinen, University of Turku, Finland; **Co-Author:**Jake McMullen, University of Turku, Finland

Photosynthesis and respiration in plants are fundamental, interconnected biological topics. Without a proper understanding of these concepts, it is impossible to realize the crucial role of plants to the planet and all life forms. Although studies have been conducted to understand students‘ conceptions, there is a lack of research regarding different types of learners‘ knowledge levels concerning heterogeneity of learners and their discipline-specific epistemic beliefs. In order to examine such individual differences, more than 1000 Lithuanian students from 7 to 11 grades answered 13 two-tier type questions dedicated to photosynthesis and respiration in plants topics. In addition, students answered 17 Likert-type questions about biology-specific epistemic beliefs. In the analysis students‘ conceptual test answers were classified as either expressing scientifically correct concepts, synthetic models, or misconceptions. Latent profile analysis shows that besides high and low performing students there are students in transition, which is characterized by low misconceptions, high synthetic models and average level of scientific concepts. Furthermore, students‘profile membership and epistemic beliefs were strongly related. Scientific profiles were associated with higher epistemic beliefs scores, non-scientific profiles had lower epistemic beliefs scores. Synthetic profile had only a little lower epistemic beliefs scores than scientific profile, but higher than non-scientific profile. Understanding of different learners could help science education researchers and teachers to understand deeper the transition phases in learning towards scientific understanding and further develop interventions that can more effectively support learning of these demanding but highly important topics.

A Comprehensive Validation Study of an Instrument for Measuring Epistemic Beliefs
Keywords: Assessment Methods, Attitudes and Beliefs, Higher Education, Knowledge Construction
Presenting Author: Belinda Berweger, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Florentine Diersch, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Baerbel Kracke, University of Jena, Germany; **Co-Author:**Julia Dietrich, Friedrich-Schiller-University Jena, Germany

The acquisition of pedagogical and psychological knowledge requires learners to evaluate and weigh different knowledge claims (e.g., contradicting scientific findings). Epistemic beliefs, defined as beliefs about knowledge and knowing, are crucial in such learning processes.Merk et al. (2017) developed a domain-specific instrument (FREE) to assess the individual level of development of students’ epistemic beliefs (absolutism, relativism, and postrelativism) when engaged in thinking about real-world educational problems. The FREE aims to quantify a person’s level of epistemic development using a D-index. However, it has not yet been examined whether the items included in the D-index actually measure the factors absolutism, relativism, and postrelativism. The aim of the present study was to validate the instrument FREE in a sample of preservice teachers (N = 468) and students of educational science (N = 149). We conducted factor analyses (EFA and CFA) and tested for reliability, and convergent, discriminant and criterion validity. The model fits did not support internal factorial validity of the instrument, which is in line with previous findings on self-report instruments in this field. However, tests for convergent and discriminant validity with other instruments measuring epistemic beliefs were in line with our expectations. Furthermore, we found significant relationships between the FREE scales and learnings strategies such as elaboration and self-regulated learning, which supports previous notions that these two constructs are interrelated.

R- and P-epistemic beliefs – On the inter- and intraindividual structure of epistemic beliefs
Keywords: Assessment Methods, Attitudes and Beliefs, Personality, Quantitative Methods
Presenting Author: Eric Klopp, Saarland University, Germany; **Co-Author:**Robin Stark, Saarland University, Germany

In the dimensional approach to epistemic beliefs, their structure is usually determined from cross-sectional data (R-data). It represents the structure of interindividual differences (R-epistemic beliefs). This structure is typically also meant to represent the structure of an individual’s epistemic beliefs. However, this is not necessarily the case. Thus, there is the question if the intraindividual structure of epistemic beliefs emanating from longitudinal data (P-data and P-

epistemic beliefs) corresponds to the structure of R-epistemic beliefs. Additionally, there is the question of whether previously occurring P-epistemic beliefs may affect current P-epistemic beliefs and whether the domain affects current P-epistemic beliefs. In this study, we investigate the structure of P-epistemic beliefs using P-factor analysis, i.e., the factor analysis of longitudinal data. We also analyze if previously occurring epistemic beliefs affect current epistemic beliefs using autoregressive vector regression models and if domains affect P-epistemic beliefs. Two individuals who provided data for 80 consecutive days. It turns out that the structure of P-epistemic beliefs did not correspond to the structure of R-epistemic beliefs. For almost all P-epistemic belief factors, the previous day's epistemic belief affected the current epistemic beliefs in the sense of an autoregressive effect, and for some P-epistemic beliefs, there were also cross-belief effects. Additionally, the domain also had effects on current P-epistemic beliefs. We discuss the implications of these findings regarding potential issues for the measurement of P-epistemic beliefs.

The Study of Conceptual Change and the Diffusion of Knowledge across Disciplinary boundaries
Keywords: Cognitive Skills and Processes, Conceptual Change, Science Education, Synergies between Learning / Teaching and Research
Presenting Author: Gregg Solomon, National Science Foundation, United States

I discuss research on conceptual change in the greater context of the diffusion of knowledge across disciplinary borders in Educational research and Cognitive Science. Two studies of knowledge integration are presented, one looking at the report How People Learn and the other at awards funded by the US National Science Foundation (NSF). The results show that all but one of the grants funded in the last ten years were to researchers in domain science departments studying undergraduates.I conclude by discussing how some of the challenges posed by this multidisciplinarity and the translation of research to practice underscore a need to re-examine how value is placed on research and researchers.

Session O 18

25 August 2023 17:00 - 18:30
UOM_R09
Single Paper
Teaching and Teacher Education

Mentoring and Coaching of Early Career Teachers

Keywords: Communication Skills, Inquiry Learning, Mentoring and Coaching, Peer Interaction, Pre-service Teachers, Qualitative Methods, Self-concept, Social Aspects of Learning and Teaching, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Jelena Radisic, University of Oslo, Norway

University and school-based support for teachers in career entry
Keywords: Mentoring and Coaching, Qualitative Methods, Social Aspects of Learning and Teaching, Teacher Professional Development
Presenting Author: Anja Winkler, University of Teacher Education Bern, Switzerland; **Presenting Author:**Daniela Freisler, Pädagogische Hochschule, Institut Forschung & Entwicklung, Bern, Switzerland

In the process of becoming and staying a teacher, career entry is considered a key phase in the professional biography of teachers. During their education at the university, students complete internships in schools and enter the profession directly after graduation. When entering the profession, challenges are perceived in the areas of teaching, extracurricular duties such as administrative and organizational tasks or meetings, and school reforms. Therefore, it's important that support services at universities and schools accompany teachers in handling suchchallenges in order to create learning opportunities for the professional development of one's own competencies. This presentation focuses on the question of which university and school support services are used for which purpose in order to support the professional development of teachers entering the profession. To answer the question, 24 teachers were retrospectively surveyed with semi-structured, guided interviews at the beginning of their second year in the profession. The results show that the first professional year was perceived by the teachers as interesting overall, but also as demanding and associated with new challenges. The more detailed analysis shows that the teachers entering the profession in various situations seek, above all, the exchange with other teachers about their experiences and difficulties that arise.

Novice teachers' sense of professional identity explored through portrait methodology
Keywords: Mentoring and Coaching, Qualitative Methods, Self-concept, Teacher Professional Development
Presenting Author: Ella AIT-ZAOUIT, Fontys University of Applied Sciences, Netherlands

In this talk I will discuss the findings of a completed doctoral research carried out on the development of four novice English teachers' sense of professional identity and how the use of portrait methodology has illuminated this. Portrait methodology is a qualitative and narrative research approach that sets out to explore the realities of participants' perspectives on their lived experiences through in-depth interviews and aims to capture the essence of these perspectives and experiences in a written portrait, which is consequently used as a reflection tool during the research process. The findings on teacher identity development within a southern Dutch context show that all four novice teachers have undergone three significant shifts in their sense of teacher identity. The research findings have furthermore presented an explicit connection between the use of portrait methodology and the construction of a narrative identity and the conceptualisation of the five Rs (implications to be taken into consideration when conducting portrait methodology). This study has shown that portrait methodology is a very effective approach to help stimulate teacher identity construction. It is recommended to build in more structured and organised *teacher identity* reflection activities as part of a professional development programme in schools and in teacher education colleges. Portrait methodology could serve as an effective reflection tool for this.

A systematic review of research on field practicum and professional identity development
Keywords: Inquiry Learning, Mentoring and Coaching, Pre-service Teachers, Self-concept
Presenting Author: Elaine Munthe, University of Stavanger, Norway

Eight teacher education programs have national frameworks that regulate their structure, content and learning outcomes in Norway. They are 1 to 5 years in duration and require 60-130 days of supervised field practice. Learning outcomes are also provided nationally for field practice. The importance of field practice is consistently highlighted in research and evaluations, but we ask: What evidence do we have about how field practice contributes to student teachers' professional identity development in Norway? To answer this question, we have re-analyzed a systematic review of research published about field practice in Norwegian ITE programmes. The review included 93 peer reviewed publications (1998 – 2019) from three international databases plus searches in Norwegian language journals.

What themes do preservice teachers focus on in peer coaching dialogues? Results of a pilot study.
Keywords: Communication Skills, Mentoring and Coaching, Peer Interaction, Pre-service Teachers
Presenting Author: Bettina Gautel, Gottfried Wilhelm Leibniz Universität Hannover, Germany; **Co-Author:**Katharina Mueller, Leibniz University Hannover, Germany

Peer coaching is increasingly recognized as an opportunity for preservice teachers (PSTs) to learn about planning and teaching (Lu, 2010), without the guidance of an expert. Previous findings report positive effects of peer coaching regarding competence development as well as motivation and self-efficacy of PST (summarized by Lu, 2010). In contrast, some studies criticize that PSTs do neither have the necessary skills to appropriately analyze lessons or lesson plans nor to give effective feedback based on this analysis (Oven, 2004). Therefore, the aim of this intervention is to provide effective communication and feedback strategies as well as assistance in setting focus areas when analyzing and discussion lesson plans. In the study, which will be presented at the conference, we focus on two areas: 1) we analyzed the themes focused on in simulated peer coaching dialogues by preservice teachers prior to the intervention and 2) evaluated their reflective analysis before and after the intervention to explore the extent to which changes regarding the awareness of general as well as genre-specific communication strategies took place. 13 audiotaped peer coaching dialogues were transcribed and analyzed using qualitative content analysis; initial

results indicate three key themes. Additionally, the reflective analysis of their peer coaching dialogues before and after the intervention were evaluated. The results indicate changes regarding the awareness of general communication and feedback strategies.

Session O 19

25 August 2023 17:00 - 18:30
UOM_A06
Single Paper
Assessment and Evaluation, Higher Education, Motivational, Social and Affective Processes

Predicting Achievement and Motivation

Keywords: Achievement, Burnout, Digital Literacy and Learning, Educational Attainment, Foreign and Second Language Acquisition, Higher Education, Informal Learning, Motivation, Quantitative Methods, Reading, Secondary Education, Special Education
Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education
Chairperson: Winnie-Karen Giera, Germany

PISA Reading Achievement, Literacy Motivation and School Burnout Predicting Educational Outcomes
Keywords: Burnout, Educational Attainment, Motivation, Reading
Presenting Author: Kati Vasalampi, University of Jyväskylä, Finland; **Co-Author:**Asko Tolvanen, University of Jyväskylä, Finland; **Co-Author:**Minna Torppa, University of Jyväskylä, Finland; **Co-Author:**Anna-Maija Poikkeus, University of Jyväskylä, Finland; **Co-Author:**Kaisa Aunola, University of Jyväskylä, Finland

In the present four-year longitudinal study, we examined how PISA reading achievement, literacy motivation and school burnout symptoms at the end of comprehensive school predict choice of educational track (academic or vocational) and educational attainment from upper secondary education. The sample consisted of 1351 Finnish students, whose PISA reading achievement, self-concept of ability in literacy, task value on literacy and school burnout symptoms of cynicism and exhaustion were assessed at the end of comprehensive school, in Grade 9 at age 15-16, their educational track during the first year of the upper secondary, and information of their qualifications from upper secondary education were achieved from school registers four years later. The results indicated that the better students performed in the PISA reading test and at the higher level their self-concept of ability in literacy was at the end of comprehensive school, the more likely they were entering academic track after comprehensive school. Symptoms of school burnout appeared different among those who ended up in academic and vocational track: the more symptoms of exhaustion students reported, the more likely they ended up in academic track, but the more symptoms of cynicism they reported, the more likely they ended up in vocational track. The results further indicated that the symptoms of exhaustion significantly increased the risk of non-completion of general upper secondary school in normative time.

How Does Studying Latin in Secondary Education Predict Study Achievement in Higher Education?
Keywords: Achievement, Foreign and Second Language Acquisition, Higher Education, Secondary Education
Presenting Author: Cathy Hauspie, Ghent University, Belgium; **Co-Author:**Stijn Schelfhout, Ghent University, Belgium; **Co-Author:**Nicolas Dirix, Ghent University, Belgium; **Co-Author:**Lot Fonteyne, Ghent University, Belgium; **Co-Author:**Mark Janse, Ghent University, Belgium; **Co-Author:**Arnaud Szmalec, Université catholique de Louvain (UCL), Belgium; **Co-Author:**Alexandra Vereeck, Universiteit Gent, Belgium; **Co-Author:**Wouter Duyck, Ghent University, Belgium

Studying Latin in secondary education has a rich tradition and is still practiced to a considerable extent in Europe. The instruction of Latin is often justified on the assumption that it leads to cognitive benefits beyond the linguistic domain. The present study set out to explore the relation between studying Latin in secondary education and later academic achievement, in 12 first year programs of open access Flemish higher education (N = 1,898). First, we demonstrated that Latin students exhibit increased levels of study achievement in higher education, and particularly in non-STEM study programs. Second, we explored in which prediction models of academic achievement the instruction of Latin was included as a predictor and thus provided incremental predictive value over 22 other cognitive, affective, and demographic factors. Latin instruction in secondary education was included as a factor in the prediction models of academic achievement in 42% of the (mainly non-STEM) programs.

English Media Use Predicts Skill and Motivation Development in English as a Foreign Language
Keywords: Achievement, Foreign and Second Language Acquisition, Informal Learning, Motivation
Presenting Author: Jennifer Meyer, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**Johanna Fleckenstein, University of Hildesheim, Germany; **Co-Author:**Maleika Krüger, University of Potsdam, Germany; **Co-Author:**Stefan Keller, Zürich University of Teacher Education, Switzerland; **Co-Author:**Nicolas Hübner, University of Tübingen, Germany

Skills in English as a foreign language are necessary for active participation in an increasingly globalized and diversified world. Consequently, fostering English-language learning constitutes a major goal of most education systems. In many countries, however, student learning is stagnating. Thus, informal learning activities have recently received increased interest as potential gateways to enhance students' formal learning progress. Informal foreign-language activities such as reading books or watching films provide important language input and learning opportunities, which might be associated with increases in achievement and motivation. In this study, we investigated how English media use during leisure time might benefit students' skills in English reading and listening as well as their English motivation (self-concept and interest). Capitalizing on rich data from a longitudinal study with a large sample of upper secondary school students in Germany (N = 1,994), we investigated different modalities (e.g., reading- and listening-focused activities) outside the laboratory. We found evidence that frequent English media use benefits both skill and motivation development. In addition, we found that reading activities had incremental power when predicting English-language skills beyond listening activities for both reading and listening comprehension skills, as well as for self-concept. The pattern differed for interest, with our results indicating positive incremental associations for the frequency of listening activities beyond reading activities. The relevance of English media use as an informal, inexpensive, and scalable leisure-time intervention is discussed.

Does the use of ICT at school predict lower PISA scores or vice versa?
Keywords: Achievement, Digital Literacy and Learning, Quantitative Methods, Special Education
Presenting Author: Nestori Kilpi, Tampere University, Finland; **Co-Author:**Ninja Hienonen, Tampere University, Finland; **Co-Author:**Mari-Pauliina Vainikainen, Tampere University, Finland

Studies have showed that the use of information and communication technologies (ICT) in leisure time, and also at school, is related to lower level of school performance. Furthermore, data from PISA studies have shown that higher levels of ICT use is related to lower scores in reading literacy, and theses findings have been interpreted as an indication of the harmful effects of digitalisation in education. The present study tests the hypothesis that ICT is used as means of support by targeting more ICT use to students performing lower at school.
The present study utilized PISA data collected in Finland between 2000 and 2018 using the Mplus software with school-level clustering and multiple group regression analyses taking into account student weight coefficients. The results showed that ICT use was negatively related to reading literacy scores, and the effects were statistically significant in all cycles. However, the ICT use explaining only one to three percent of the variation in reading literacy scores. Analyzed by proficiency levels, we examined whether these different levels of student performance explained negative effects of ICT use on reading literacy scores. On average, students at the lowest levels used ICT in school more than those at higher levels. Based on the results, we argue that previous interpretations of the negative effects of ICT use on learning outcomes have been overstated and that the results primarily reflect the use of ICT as a tool for differentiation and support lower performing students.

Session O 20

25 August 2023 17:00 - 18:30

UOM_A10
Single Paper
Assessment and Evaluation, Higher Education, Lifelong Learning

Aspects of Healthcare Education

Keywords: Assessment Methods, Attitudes and Beliefs, Communication Skills, Competencies, Educational Technologies, Feedback, Health-care Education, Higher Education, Lifelong Learning, Qualitative Methods
Interest group: SIG 01 - Assessment and Evaluation, SIG 14 - Learning and Professional Development
Chairperson: Javier Fernández, Universidad de Leon, Spain

Measuring communication competence of medical students: Validation of a situational judgment test
Keywords: Assessment Methods, Communication Skills, Health-care Education, Higher Education
Presenting Author: Sabine Reiser, University of Erfurt, Germany; **Co-Author:**Laura Schacht, University of Erfurt, Germany; **Co-Author:**Eva Thomm, University of Erfurt, Germany; **Co-Author:**Kristina Schick, Technical University of Munich, Germany; **Co-Author:**Pascal Berberat, TUM Medical Education Center, Germany; **Co-Author:**Martin Gartmeier, Technical University of Munich (TUM), Germany; **Co-Author:**Johannes Bauer, University of Erfurt, Germany

Patient-encounters, for example during an initial conversation, are a daily task for physicians. An effective communication between physician and patient provides a basis for successful treatment and the provision of optimal care. Therefore, it is important to foster medical communication competence (MCC) in medical studies and assess its development. To measure MCC we designed the *Video-Based Assessment of Medical Communication Competence*(VA-MeCo), a construct-driven Situational Judgment Test. The VA-MeCo assesses MCC along three dimensions: *advancing the content* of the conversation, *providing structure*, and *building a relationship* in the conversation. Extending evidence from preliminary studies, the present contribution presents an in-depth evaluation of the test's reliability and validity based on a sample of $N = 395$ medical students. First, factor analyses showed that the test adequately reflects the theoretically assumed three-dimensional structure of MCC. Second, consistent with earlier results, we found high reliability for the tests' total and subscale scores (McDonald's $\omega > .81$). Third, concerning construct validity, correlations with convergent and discriminant measures were largely consistent with theoretical expectations. Altogether, these findings indicate that the VA-MeCo is a promising instrument to measure MCC in medical education.

"Am I being observed?": Medical students' perceptions about remote proctoring
Keywords: Assessment Methods, Attitudes and Beliefs, Educational Technologies, Health-care Education
Presenting Author: Vasiliki Andreou, KU LEUVEN, Belgium; **Co-Author:**Sanne Peters, University of Melbourne, Australia; **Co-Author:**Jan Eggermont, KU LEUVEN, Belgium; **Co-Author:**Birgitte Schoenmakers, KU LEUVEN, Belgium

The COVID-19 pandemic obliged medical educators to embrace technology and to search for innovative and viable solutions for administering safe but academically integral high-stakes medical exams. By looking for solutions outside the realm of medical education, remote proctoring has gained medical educators' interest to facilitate high-stakes exam administration, while reducing the chances of cheating. To evaluate whether remote proctoring could offer a viable solution, we aimed to explore medical students' perceptions about remote proctoring during an online high-stakes medical exam. Specifically, we utilised remote proctoring to remotely administer a high-stakes proficiency-testing exam for admission to the Flemish Postgraduate General Practitioner's Training. We used a survey comprising 6 closed-ended and 2 open-ended questions to explore medical students' perceptions. We used an exploratory factor analysis and thematic analysis respectively to analyse the data. In total, 472 students took the proficiency-testing exam remotely using the remote proctoring software. Out of 472, 304 filled in the questionnaire, 213 women and 91 men. Our findings indicate that students' perceptions are ambiguous regarding remote proctoring. Increased text anxiety but also feelings of reassurance are indicative of students' mixed feelings about remote proctoring.

Context factors affecting experienced agency to engage in interprofessional feedback dialogues
Keywords: Assessment Methods, Feedback, Health-care Education, Lifelong Learning
Presenting Author: Marije Lesterhuis, UMC Utrecht, Netherlands; **Co-Author:**Marijke Eurelings, Spaarne Gasthuis, Netherlands; **Co-Author:**Marieke van der Schaaf, University Medical Center Utrecht / Utrecht University, Netherlands; **Co-Author:**Reinier Hoff, University Medical Center Utrecht, Netherlands

Interprofessional feedback at the workplace can be driver of residents´ development and improvement of communication and collaboration in healthcare teams. However, interprofessional feedback dialogues are still scarce. We questioned which contextual factors affect residents and healthcare professionals´ feelings of agency to engage in this dialogue. Agency is defined as the interaction between the individual´s capacity and context factors. Therefore, semi-structured interviews (residents *n=9,* healthcare professionals *n*=9) were performed and thematically analyzed on the factors mentioned. Results are presented according to different social systems of interactions: from microsystems representing residents and healthcare professionals' interactions, till exo- and macro systems that create policies and norms respectively that affect feelings of agency. We conclude that in the complex context of a hospital, existing out of several systems, many factors affect feelings of agency. For example, on the level of the residents and healthcare professionals, experienced capacity and attitude are at play. Curriculum designers affect the feelings of agency by the feedback instruments provided for residents. But feedback culture and experienced hierarchy play a role as well. For future research on the effectiveness of feedback interventions these results imply that context needs to be considered. For practice this means that when aiming to increase interprofessional feedback, multiple stakeholders within a hospital should be aware on how they can play a role.

The impact of paediatric public health degree programs: hope for South Africa.
Keywords: Competencies, Health-care Education, Higher Education, Qualitative Methods
Presenting Author: Danica Sims, University of the Western Cape, South Africa; **Co-Author:**Anthony Westwood, University of Cape Town, South Africa; **Co-Author:**Jawaya Shea, University of Cape Town, South Africa

Background: Maternal, neonatal, child and adolescent Public Health (MNCAPH) is a discipline in the health sciences that deals with the many areas that determine the health and wellbeing of these vulnerable groups.*Methods*: Graduates of MNCAPH programs, from a number of African countries, were invited to participate in online semi-structured interviews (n = 13). Thematic analysis of verbatim transcripts was undertaken.*Results*: Three dominant themes were developed: educational content; educational practice; and, the impact of educational programmes; along with a number of sub-themes and descriptors. For educational content, the public health perspective, including contextualised community-based child rights and advocacy, was emphasised. The courses on leadership and management were especially helpful for district-level health professionals. In terms of educational practice, encompassing the flexible blended teaching, learning and assessment approaches, graduates found the diversity of their peers to be rich resources to draw upon, the interdisciplinary teaching staff valuable, the remote learning environment supportive, but the workload intensive and institutional administrative support lacking. The reflective and experiential pedagogical methodology was highlighted as effective. Graduates' experiences of their postgraduate MNCAPH training was overwhelmingly positive. The impact of the programmes were evidenced by improved senses of agency, leadership and management competency by graduates. Furthermore, their metacognitive reflection, communication skills, public health systems thinking and use of data for systemic decision-making were enhanced. Some graduates reported career promotion as a result of their qualification.*Conclusions*: Overall, the MNCAPH curricula were found to be contextually responsive, addressing African health system needs.

Session O 21

25 August 2023 17:00 - 18:30
UOM_A05
Single Paper
Higher Education, Learning and Instructional Technology, Learning and Social Interaction

Remote Learning and Evaluation in Higher Education

Keywords: Assessment Methods, E-learning/ Online Learning, Higher Education, Learning Analytics, Mixed-method Research, Pandemic, Pre-service

Teachers, Self-efficacy, Self-regulated Learning and Behaviour
Interest group: SIG 04 - Higher Education, SIG 10 - Social Interaction in Learning and Instruction
Chairperson: Hanke Korpershoek, University of Groningen, Netherlands

Students' experiences of remote online exams at a distance learning university
Keywords: Assessment Methods, E-learning/ Online Learning, Higher Education, Pandemic
Presenting Author: Simon Cross, The Open University, United Kingdom; **Co-Author:**Maria Aristeidou, Institute of Educational Technology/The Open University, United Kingdom; **Co-Author:**Klaus-Dieter Rossade, The Open University, United Kingdom; **Co-Author:**Carlton Wood, The Open University, United Kingdom

As a result of the Covid-19 pandemic, universities had to re-structure their assessment design, policies and processes. The assessment conversation around the design of the online exams and the technology used aimed at ensuring that student expectations were met while securing assessment standards. This study aimed to explore student views at a major distance-learning university in the UK about participating in online remote exams. The institution replaced the common pre-covid practice of taking face-to-face exams at local centres appointed by the university with remote open book-style exams. Findings from 107 student responses to an online survey on online exams pointed to positive and negative areas of experience with online exams. This study provides an agenda for universities with temporary and permanent distance learning programmes to develop or improve ways that students or particular groups of students are assessed by providing positive areas of perception.

Reducing cheating behavior in online exams by considering students' needs, conceptions, and reasons
Keywords: Assessment Methods, E-learning/ Online Learning, Higher Education, Mixed-method Research
Presenting Author: Marco Rüth, University of Cologne, Germany; **Co-Author:**Maria Jansen, University of Cologne, Germany; **Co-Author:**Kai Kaspar, University of Cologne, Germany

University students have been taking online exams with increasing frequency since the start of the Covid-19 pandemic. However, cheating is widespread in online exams and can hamper the informative value of exam results as well as student learning and well-being. To reduce cheating behavior in online exams, university students' needs, conceptions, and reasons should be considered and understood in more detail. Consequently, we examined the role of students' needs, conceptions, and reasons in students' cheating behavior by means of an experimental, correlational, and qualitative approach. Based on an online survey of 339 university students, we identified important student needs, conceptions, and reasons. University students' cheating intention was lower when they expected exam content that is relevant to their profession, practically relevant exam tasks, and detailed feedback. In addition, university students' past cheating behavior was lower when they agreed that online exams improve teaching, and students refrained from cheating because of fear of consequences and moral standards and values. Overall, our findings can be useful in the design of online exams and support efforts to reduce cheating.

Using a conversational agent to support goal setting amongst higher education students
Keywords: E-learning/ Online Learning, Higher Education, Learning Analytics, Self-regulated Learning and Behaviour
Presenting Author: Gabrielle Martins Van Jaarsveld, Erasmus University Rotterdam, Netherlands; **Co-Author:**Jacqueline Wong, Utrecht University, Netherlands; **Co-Author:**Martine Baars, Erasmus University Rotterdam, Netherlands; **Co-Author:**Marcus Specht, TU Delft, Netherlands; **Co-Author:**Fred Paas, Erasmus University Rotterdam/University of Wollongong, Netherlands

Goal setting is the first and driving stage of the self-regulated learning (SRL) cycle. Studies have shown that supporting goal setting is an effective means of improving academic performance and SRL skills among higher education students. However, doing so can be a complex and resource-intensive process. In this study, a goal-setting conversational agent was designed and deployed to support higher education students in setting and reflecting on short-term academic goals. Following a 2x2 factor design, we tested the effect of goal setting prompts (guided vs. unguided) and Feedback (with vs. without) when delivered via a goal setting conversational agent. We explored the effect of these goal setting characteristics (i.e., guidance and feedback) on students' 1) goal quality, 2) goal attainment, and 3) changes in goals over time. Findings showed that both guidance and feedback had a significant effect on goal quality. They also revealed that goal guidance provided initially high-quality goals, but feedback was needed to maintain this quality over time. This study provides insights into how a goal setting conversational agent can be used to support the academic goal setting process for higher education students. Furthermore, this study informs future iterations of the design of this goal setting conversational agent, which will be trained to offer students personalized support and feedback to enhance their SRL process.

Back to face-to-face teaching and learning: I (don't) want to!
Keywords: E-learning/ Online Learning, Higher Education, Pre-service Teachers, Self-efficacy
Presenting Author: Elisabeth Seethaler, Pädagogische Hochschule Salzburg, Austria; **Presenting Author:**Julia Klug, PH Salzburg, Austria

When courses began to be held online in March 2020 due to COVID-19, we did not know yet that the following four semesters would be almost completely online. This brought unknown challenges for teachers and students. In 2021, we investigated teacher students' preferences for online vs. f2f learning, their self-efficacy, motivation, emotions and self-assessed achievement in an online-learning (OL) setting after two semesters of pandemic-caused OL. In the present study, we want to compare the findings of the previous study with a sample of teacher students with four semesters of OL to see if their assessments differ. We used data of 135 teacher students from an Austrian educational university (53 with four and 82 with two semesters of OL experience). All participants worked on the Teachers' Sense of Efficacy Scale and self-constructed closed and open-ended items to assess their preferences, reasons, effort, achievement, motivation and emotions. Combining quantitative and qualitative analyses, we found that most of the students still prefer f2f teaching, even after four semesters of OL. However, the advantages they see in OL are more differentiated when teachers and students are more experienced in OL. Teacher self-efficacy still rises in the fourth semester of OL. Students evaluate effort as lower than and achievement as similar as in f2f teaching. Levels of affect and motivation do not differ between the four- and two-semester OL groups. These results can give us hints for planning future courses, like relying on approved OL methods, whilst getting back to f2f teaching and learning.

Session O 22

25 August 2023 17:00 - 18:30
UOM_CR
Single Paper
Assessment and Evaluation

Large-scale Assessments of Mathematics and Numeracy

Keywords: Achievement, Assessment Methods, Educational Policy, Large-scale Assessment, Learning Analytics, Mathematics/Numeracy, Migrant / Refugee and Minority students, Primary Education, Secondary Education, Vocational Education and Apprenticeship Training
Interest group: SIG 01 - Assessment and Evaluation, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Jolien Mouw, University of Groningen, Netherlands

Learning Aids' Effect on Mathematics in Grade 8 of Vocational Education in Flanders (Belgium)
Keywords: Large-scale Assessment, Mathematics/Numeracy, Secondary Education, Vocational Education and Apprenticeship Training
Presenting Author: Margo Vandenbroeck, KU LEUVEN (BE 0419.052.173), Belgium; **Co-Author:**Jonas Dockx, KU LEUVEN, Belgium; **Co-Author:**Rianne Janssen, KU LEUVEN, Belgium

Based on the sociocultural theory of learning and distributed cognition, using learning aids should benefit students' performance, as learning aids can compensate for a lack of knowledge or skills and reduce strain on short term memory. The present study investigated the use of a diverse set of learning aids in Grade 8 of vocational education in Flanders (northern part of Belgium) and whether access to learning aids affects students' mathematics performance. Data from the 2019 National Assessment on Mathematics were used. A field experiment was conducted, with a condition where students were allowed to use

learning aids and a condition where students were not allowed to use learning aids. A multilevel model was used to test for differences. The results revealed that access to learning aids does not significantly increase students' performance, and, thus, access to learning aids does not generate an unfair advantage.

Not Adding It Up: Grade 1 mathematics outcomes in two South African provinces
Keywords: Achievement, Large-scale Assessment, Mathematics/Numeracy, Primary Education
Presenting Author: Irene Pampallis, University of the Witwatersrand, South Africa; **Co-Author:**Nic Spaull, Stellenbosch University, South Africa; **Co-Author:**Cally Ardington, University of Cape Town, South Africa; **Co-Author:**Ingrid Sapire, University of the Witwatersrand, South Africa; **Co-Author:**Permie Isaac, Funda Wande, South Africa

Although improving school mathematics has long been a policy priority in South Africa, learning outcomes remain low. Given the cumulative nature of mathematics, it is likely that learning deficits have their origins in the early grades. However, no reliable large-scale studies have yet assessed the mathematics knowledge of South African students younger than Grade 3. This paper begins to fill in this gap by reporting findings from two large studies of Grade 1 students. A total of 3,264 students from 57 schools in the Eastern Cape province and 120 schools in Limpopo province completed Early Grade Mathematics Assessments, testing various components of early numeracy. The test questions were classified using Fritz et al.'s (2020) 5-level model of numerical conceptual development. The results showed poor conceptual understanding overall. Very few learners (30% from the Eastern Cape sample and 27% from the Limpopo sample) had reached Level 3 (an understanding that numbers can be decomposed into smaller units), which is the basis for over 70% of the Grade 1 curriculum. This means that the bulk of the curriculum is not accessible to most children. It was also found that most participants had low computational fluency with addition and subtraction. Taken together, these results suggest that the faultlines in South African mathematics education are firmly in place before the end of Grade 1. The practical implications are clear: resources should be channelled towards developing early grade mathematics, and curricular reform should be considered to develop learners' number concept from a more basic level.

Time on task in 9th grade low-stakes and high-stakes Math assessment
Keywords: Achievement, Assessment Methods, Educational Policy, Large-scale Assessment
Presenting Author: Janica Vinni-Laakso, University of Helsinki, Finland; **Co-Author:**Risto Hotulainen, University of Helsinki, Finland; **Co-Author:**Sirkku Kupiainen, University of Helsinki, Finland

The present study incorporates two strands of educational research and theory: The relative impact of cognitive competence and motivational attitudes in explaining achievement, and the mediating role of time on task (TOT) on students' attainment in high-stakes vs. low-stakes assessment. The data is drawn from a national sample of 8495 Finnish ninth graders in an assessment of curricular and non-curricular competences and motivation. The results based on Structural Equation Model show that motivational attitudes relates to Math test scores in low-stakes and high-stakes conditions, and more strongly in low-stakes condition. TOT was shown to mediate the association between motivational attitudes and Math test scores in both conditions, while also showing direct relations. TOT was shown to mediate the effects between motivational attitudes and Math test scores more strongly in low-stakes than in high-stakes assessment. Girls, on average, spend more time on Math tasks in both test conditions compared to boys. However, gender was not significantly related to test scores directly. Finally, academic achievement was associated with motivational attitudes, TOT, and Math test scores in both low-stakes and high-stakes conditions. The results have implications for schools/ teachers and for interpreting the results of both national and international low-stake assessments.

What explains the performance gap in mathematics between native and immigrant students in Finland?
Keywords: Large-scale Assessment, Learning Analytics, Mathematics/Numeracy, Migrant / Refugee and Minority students
Presenting Author: Faruk Nazeri, Tampere University, Finland; **Co-Author:**Mari-Pauliina Vainikainen, Tampere University, Finland

Students' immigrant background is associated with weaker educational achievement. The PISA studies have revealed that the difference between immigrant and native students is among the largest in Finland. It has been suggested that immigrant students' lacking skills in the language of teaching is reflected on their performance in other areas. The aim of this study was to explain the differences between native and immigrant students in mathematics assessment tasks. We used the data from a nationally representative DigiVOO study (N=8557) assessing students' performance in Finnish and Mathematics. We used multiple-group structural equation modelling to compare native students, first and second generation immigrants, and multicultural students. The results showed expected differences between the groups in the Finnish and Mathematics tests. Students' performance in the Finnish test was a relatively strong predictor of performance in all groups. The use of digital technology in schools predicted math scores negatively, but the effect was statistically significant only for native students who reported lower levels of technology use compared to the different immigrant groups. The strongest predictor of performance was time on task extracted from the log files. This indicates that the deficits in the language of teaching is only a partial explanation of lower performance of immigrant students in other domains and the effort put in assessment tasks also play a significant role. We conclude that lower performance of immigrant students is a much more complicated phenomenon than what assessment research has often focused on and discuss possible ways of closing performance gaps.

Session O 23

25 August 2023 17:00 - 18:30
UOM_A04
Single Paper
Instructional Design, Learning and Special Education

Metacognitive Processes and Self-regulated Learning in Text Comprehension

Keywords: Comprehension of Text and Graphics, Early Childhood Education, Educational Technologies, Instructional Design, Learning Strategies, Metacognition, Reading, Secondary Education, Self-regulated Learning and Behaviour
Interest group: SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Yiannis Georgiou, Cyprus University of Technology, Cyprus

A Comparison Between Rereading and Reading of Multiple Texts
Keywords: Learning Strategies, Metacognition, Reading, Self-regulated Learning and Behaviour
Presenting Author: Peter Seban, Institute of Psychology, Czech Academy of Sciences, Slovakia; **Co-Author:**Kamila Urban, Institute for Research in Social Communication, Slovak Academy of Sciences, Slovakia; **Co-Author:**Radovan Šikl, Institute of Psychology, Czech Academy of Sciences, Czech Republic

Rereading is a widely used learning technique but its effectiveness is questionable. We have therefore investigated whether the multiple text reading technique, which is rather similar to rereading, might provide more benefits to learners. We used an experimental design where we compared test performance and accuracy of metacognitive judgements of a multiple text reading group, rereading group, and single reading group in a one-day vs. one-week delayed test. 186 psychology students participated in the experiment. Results of the knowledge test indicate that in the one-day delayed test, multiple text reading and rereading yield similar results: both deliver slightly better results than single reading. In the one-week delayed test, though, multiple text reading yields better results than rereading, and both these techniques outperform single reading. Moreover, multiple text reading results in fairly robust knowledge retention with only a slight decrease in scores between the one-day delayed and one-week delayed test. Regarding metacognitive monitoring, judgements of learning in the multiple text reading group remained relatively stable after each reading and participants were underconfident about their knowledge. In the rereading group, judgements of learning increased after each reading and participants were overconfident about their knowledge, especially on the one-day delayed test.

The Role of Headings for Self-Regulated Learning From Texts
Keywords: Instructional Design, Metacognition, Reading, Self-regulated Learning and Behaviour
Presenting Author: Anja Prinz-Weiß, University of Education Karlsruhe, Germany; **Co-Author:**Aline König, University of Education Freiburg, Germany

When learning from texts, it is important not only that learners remember and comprehend the contents but also that they monitor and accurately judge their memory and comprehension so as to efficiently regulate their learning. In the present experiment with 51 university students, we investigated to what extent

headings within texts promote these processes. The results revealed that headings supported learners in comprehending the texts as well as in accurately judging their comprehension. The effects of headings on memory and judgment accuracy concerning memory were less pronounced. This study indicates the usefulness of implementing headings in texts to support learners in self-regulated learning from texts.

Do E-book interventions help promote near-transfer in first-grade students?
Keywords: Early Childhood Education, Educational Technologies, Metacognition, Self-regulated Learning and Behaviour
Presenting Author:GILA DUSHNITZKY, Talpiot College of Education, Israel; **Co-Author:**Adina Shamir, Faculty of Education, Bar-Ilan University, Israel

Children at-risk for SLD are often characterized by developmental delays in language and literacy acquisition and show difficulties in metacognitive skills that might affect transfer of previous learning to new contexts. Thus, researchers are looking for interventions that could support such literacy abilities and transfer. The current study investigated the effects of metacognitive interventions (general/specific/combined) with an electronic book (e-book) for promoting transfer of literacy (vocabulary, word reading, story comprehension) among 150 first-grade students at risk for SLD, from one e-book to a different e-book with a similar structure. The findings show that specific and combined metacognitive interventions may support transfer of vocabulary & story comprehension. However, the metacognitive interventions do not support transfer of Word Reading from the e-book. The results will be discussed.

Improving Monitoring Accuracy and Text Comprehension: Effects of Delayed and Immediate Diagramming
Keywords: Comprehension of Text and Graphics, Instructional Design, Secondary Education, Self-regulated Learning and Behaviour
Presenting Author: Sophia Braumann, University Utrecht, Netherlands; **Co-Author:**Margot van Wermeskerken, Utrecht University, Netherlands; **Co-Author:**Héctor J. Pijeira-Díaz, Maastricht University, Netherlands; **Co-Author:**Janneke van de Pol, Utrecht University, Netherlands; **Co-Author:**Anique de Bruin, Maastricht University, Netherlands; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

Learners need to make strategic study decisions, such as planning, seeking help, and restudying, based on their judgments about their own text comprehension (i.e., monitoring). Unfortunately, students' monitoring of their own text comprehension is often inaccurate, which can lead to suboptimal restudy decisions. Completing causal diagrams after text reading (i.e., diagramming) has been shown to improve students' monitoring of text comprehension to some extent. Furthermore, studying completed causal diagrams was shown to improve text comprehension. In two experiments, we investigated whether students' monitoring accuracy and text comprehension could be further improved by providing feedback in the form of a correctly completed diagram (i.e., standard) with and without instructions for scoring one's own diagrams. Additionally, we tested whether the effect of self-scoring instructions (SSI) on monitoring accuracy transfers to later trials without SSI, and whether delayed (Experiment 1) or immediate (Experiment 2) diagramming after reading improves monitoring accuracy and text comprehension. In Experiment 1, 125 secondary school students were assigned to one of two conditions: diagramming+standard or diagramming+standard+SSI. We found that students with SSI did not outperform students without SSI on monitoring accuracy or text comprehension on the delayed diagramming task. We conclude that providing explicit self-scoring instructions during diagramming does not have an added value for improving students' monitoring accuracy compared to diagramming and receiving a correct diagram-standard in a delayed diagramming intervention. Data collection for Experiment 2 on the effects of immediate diagramming is still ongoing and results will be presented during EARLI.

Session O 24

25 August 2023 17:00 - 18:30
UOM_R01
Poster Presentation
Higher Education, Instructional Design, Motivational, Social and Affective Processes

Science and STEM: Achievement and Instructional Design

Keywords: Achievement, Cultural Diversity in School, Gender Issues, Higher Education, Instructional Design, Mathematics/Numeracy, Meta-analysis, Metacognition, Motivation, Quantitative Methods, Science and STEM, Science Education, Teacher Professional Development, Well-being
Interest group: SIG 08 - Motivation and Emotion, SIG 16 - Metacognition and Self-Regulated Learning, SIG 21 - Learning and Teaching in Culturally Diverse Settings, SIG 22 - Neuroscience and Education, SIG 25 - Educational Theory
Chairperson: Christian Leukel, University of Education Freiburg , Germany

GaiaXus Citizen Science: New Avenues for Metacognition, STEM Career Motivation, and Achievement
Keywords: Achievement, Metacognition, Motivation, Science and STEM
Presenting Author: Suzanne Hiller, Blue Swallow Farm Foundation, Center for Research and Instruction in the Natural World, United States

Citizen science, an activity where hobbyists collect data for professional research studies, provides authentic learning experiences, which support student STEM self-motivational beliefs, achievement, and career motivation. An area less studies is how integrating metacognitive monitoring within citizen science program further enhances these dynamics. The current presentation outlines a series of studies using the GaiaXus probe, an innovative tool which precisely measures water quality, while simultaneously providing citizen scientists with metacognitive prompts to analyze and interpret data. Research studies occurred in the Southeast United States with high school citizen science programs, which incorporated the GaiaXus probe, contributory and student-directed forms of citizen science, and interactions with scientists and engineers. Findings from this body of work highlight the implications of this type of tool for expanding student achievement, self-motivational beliefs, environmental attitudes, and behaviors. Suggestions for practical classroom applications and future research will be provided.

Concreteness in Quantum Chemistry
Keywords: Higher Education, Instructional Design, Science and STEM, Science Education
Presenting Author: Charlotte Müller, ETH Zurich, Switzerland; **Co-Author:**Markus Reiher, ETH Zurich, Switzerland; **Co-Author:**Manu Kapur, ETH Zurich, Switzerland

Concreteness fading is an instructional approach that suggests to start with concrete representations and progress sequentially to more idealized representations. It has been previously argued that since external representation highly differ between domains, concreteness fading might not be generalizable. Here, we argue from the perspective of the definition of concreteness rather than the external representations. We analyze standing domain-specific definitions of concreteness in chemistry and offer a starting point for a discussion to solve this verbal dispute. Specifically, we argue that concreteness might not be sufficiently described when defined unidimensional. Rather, aspects of concreteness that are targeted should be clearly specified.

Is mathematics and science integration worth the cost?
Keywords: Instructional Design, Mathematics/Numeracy, Meta-analysis, Science and STEM
Presenting Author: Patrice Potvin, Université du Québec à Montréal, Canada; **Co-Author:**Emmanuel Ahr, Université du Québec à Montréal (UQAM), Canada; **Co-Author:**Stéphane Cyr, Université du Québec à Montréal (UQAM), Canada; **Co-Author:**Martin Riopel, Université du Québec à Montréal (UQAM), Canada

Hurley's 2001 systematic review on mathematics and science integration revealed a somewhat positive effect of fully integrated and mathematics-infused science lessons on science performances. As many national and international institutions made calls for a better integration of mathematics and science for the 21st century, we investigated the current state of the question by means of a qualitative and quantitative systematic review of the literature from the last twenty-five years. We found as few as five studies that addressed this issue by means of a pre-test/post-test and experimental group/control group design. A detailed examination of these five studies revealed that mathematics-infused science lessons does improve mathematics and mathematics-infused science performances more than science lessons that did not purposedly include mathematics. Mathematics-infused and non-integrated lessons impacted pure science performances equally. Moreover, one study revealed that a fully integrated lesson did not improve performances on an integrated science assessment more than a non-integrated lesson. Our findings support somewhat of a truism according to which mathematics-infused science lessons improve science performances on mathematics-infused science assessments only.

Effect of a Workshop Intervention on Faculty Instructional Practices: A Randomized Control Trial
Keywords: Higher Education, Quantitative Methods, Science and STEM, Teacher Professional Development
Presenting Author:jenefer husman, University of Oregon, United States; **Co-Author:**Maura Borrego, The University of Texas at Austin, United States; **Co-Author:**Cynthia Finelli, University of Michigan, United States; **Co-Author:**Michael Prince, Bucknell University, United States; **Co-Author:**Lea Marlor, University of Michigan, United States

In this study, we utilized a randomized control trial to evaluate the effect of a faculty development workshop on Science, Technology, Engineering, and Mathematics undergraduate faculty's plans to use Active Learning and Strategies to Reduce Students' Resistance to Active Learning. Additionally, we examined the impact of the workshop on changing the relation between faculty's perception of student attitudes on changes in their instructional practices. We found, over the course of the term, participants increased their plans to use Active Learning and Strategies to Reduce Students' Resistance to Active Learning regardless of their participation in the faculty development workshop. The workshop did increase faculty's plan to use Explanation Strategies to Reduce Resistance. Additionally, we found that the workshop did have an impact on the relation between faculty's perception of Student Attitudes as a Barrier to change in instructional practices and their change in plans to use Active Learning and Explanation strategies. These findings suggest that even a relatively short faculty workshop can have a modest effect on changes to instructional practices and highlight the importance of using rigorous research methodology when testing the effectiveness of any intervention.

"you're supposed to be good at science": Making Experiences of Asian-American Women in STEM Visible
Keywords: Cultural Diversity in School, Higher Education, Science and STEM, Well-being
Presenting Author: Dionne Cross Francis, University of North Carolina at Chapel Hill, United States; **Co-Author:**Jasmyne Yeldell, University of North Carolina Chapel Hill, United States; **Co-Author:**Pavneet Kaur Bharaj, University of North Carolina, United States; **Co-Author:**Anina Mahmud, University of North Carolina, United States; **Co-Author:**Kerrie Wilkins-Yel, University of Massachusetts Boston, United States

One of the poignant issues influencing Asian-American Women of Color's racialized and gendered experiences in STEM is the ostensibly positive stereotype surrounding their academic ability, described as the Model of Minority Myth (MMM). We explored how this phenomenon impacted Asian-American women's experiences within academic spaces. Based on the data from participants' race/gender-based experience, we found that all participants either downplayed these experiences or internalized the existing positive stereotypes without recognizing its psychological toll on their mental wellbeing. The study calls to go beyond simply raising institutional and faculty and student awareness about creating healing spaces with meaningful interaction across racial groups.

Gender differences in adolescents' task value development based on dimensional comparison
Keywords: Achievement, Gender Issues, Motivation, Science and STEM
Presenting Author: Kezia Olive, University of Helsinki, Finland; **Co-Author:**Janica Vinni-Laakso, University of Helsinki, Finland; **Co-Author:**Junlin Yu, University of Helsinki, Finland; **Co-Author:**Katariina Salmela-Aro, Helsinki University, Finland

This study addresses gender differences in values through examining relationships between past achievement to subsequent task values. Taking the Situated Expectancy-Value Theory framework (Eccles, 2011; Eccles et al., 1983), we aim to investigate the processes through which girls and boys develop their task values based on previous achievement through dimensional comparison (Möller & Marsh, 2013). Participants were from a longitudinal sample of students from 38 middle schools in Helsinki (N = 1471, mean age at grade 7 = 12.8 years old). We use their task values and achievement data from grade 7 to 9 in Mathematics, Physics, and Finnish language subjects. We will model their end-of-year grades in the specific subjects and their subsequent task values in each domain using multi-group analysis. We hypothesize that girls and boys differ in the strength of their cross-domain comparison. Specifically, we expect gender differences in the strength of cross-domain comparison between subjects in mathematical domains (i.e., mathematics and Physics) and verbal domain (Finnish language). Preliminary analysis shows that girls' subsequent task values seem to be more influenced by their verbal domain achievement, while boys by their mathematical achievement. Further investigation will test whether the direction and strength of the relationship between achievement and subjective task value is moderated by gender. These results will inform educators and researchers alike on potential points for interventions to support students' domain-specific values development.

Session O 25

25 August 2023 17:00 - 18:30
UOM_R03
Poster Presentation
Higher Education

Higher and Doctoral Education

Keywords: Achievement, At-risk Students, Attitudes and Beliefs, Communities of Learners and/or Practice, Developmental Processes, Doctoral Education, Educational Attainment, Educational Policy, Engagement, Higher Education, Interest, Lifelong Learning, Metacognition, Quantitative Methods, Researcher Education, Science and STEM, Self-efficacy, Synergies between Learning / Teaching and Research, Teaching/Instructional Strategies, Writing/Literacy
Interest group: SIG 04 - Higher Education, SIG 14 - Learning and Professional Development, SIG 24 - Researcher Education and Careers
Chairperson: Koula Charitonos, The open university UK, United Kingdom

Exploring the dynamic features of team reflexivity in student project teams
Keywords: Communities of Learners and/or Practice, Higher Education, Lifelong Learning, Metacognition
Presenting Author: Lieke Lochten, University of Antwerp, Belgium; **Co-Author:**Piet Van den Bossche, University of Antwerp, Belgium; **Co-Author:**Sven De Maeyer, Antwerp University, Belgium

Teams are widely used in workplaces and workforces. The past decades, many scholars have studied how teams function and what determines their success. Teams have to cope with setbacks, adapt and grow to remain successful. These crucial actions relate to the concept of team reflexivity. Although many studies conclude that reflexivity is helpful for team performance, the process of the phenomenon has received far less attention. There is no profound understanding about how reflexivity develops and manifest in teams. This study aims to describe the dynamic features of team reflexivity. More specifically, it will explore whether and how different reflexive behaviors develop and evolve over the course of a team's lifespan. In a longitudinal study with 12 student project teams, we discovered several patterns in the developmental path of team reflexivity. We conclude that team reflexivity does not develop in a linear way, but has fluctuations over time. Furthermore, we noticed differences in the reflexive trajectory between teams and between underlying behaviors and components of team reflexivity.

Student Engagement and the Learning Environment in the First Year in HE – A Systematic Review
Keywords: Achievement, Developmental Processes, Engagement, Higher Education
Presenting Author: Taiga Brahm, University of Tübingen, Germany; **Co-Author:**Mikaël De Clercq, Université catholique de Louvain (UCL); Académie de Recherche et de l'Enseignement Supérieur (ARES), Belgium; **Co-Author:**Franziska Zellweger, Zurich University of Teacher Education, Switzerland

The question of students' successful transition to Higher Education (HE) has been largely investigated for many years now. Research showed that student's engagement is one of the most proximal predictor of student success and that students' diversity need to be considered in order to better understand this challenging period. Yet it is still unclear today how the learning environment empirically plays a role for the transition of diverse students during their first-year of studying. Grounded in the educational interface model, this systematic literature review investigated recent studies on students' experience during the first-year in HE. More precisely, this research focuses on the question: How does the learning environment support student engagement during the transition to HE? Guided by the PRISMA 2020 statement, the search string allowed to identify 349 studies. Those studies were screened and refined to 22 articles directly relevant to our research question. Content analysis of the full papers will be conducted which will be finished for the EARLI conference.The result of this

systematic review aimed at reducing the shortage of consideration of the learning environment on first-year experience. It also focused on the identification of the features of the learning environment that provide a better consideration for students' diversity. From a practical point of view, a clarification of the role of the learning environment can support lecturers in designing more engaging classes and study programs.

Professional identity development and academic success during the transition to higher education
Keywords: Achievement, Educational Attainment, Higher Education, Quantitative Methods
Presenting Author: Pieter van Lamoen, Erasmus University Rotterdam, the Netherlands, Netherlands; **Co-Author:**Marieke Meeuwisse, Erasmus University Rotterdam, Netherlands; **Co-Author:**Annemarie Hiemstra, Erasmus University Rotterdam, Netherlands; **Co-Author:**Arends Lidia, Erasmus University Rotterdam, Netherlands; **Co-Author:**Sabne Severiens, Erasmus University Rotterdam, Netherlands

Besides being a challenging educational transition, the transition to higher education (HE) can be understood as a major career transition that constitutes the start of students' professional identity development in particular fields, for instance, Law, Engineering, or Medicine. The purpose of this paper was to investigate the development of ethnic majority and minority Law students' professional identity over the course of their first year in HE and the extent to which this identity is influenced by perceived social factors in the learning environment (sense of belonging to the study programme and teachers as role models). Further, it was tested whether a strong professional identity supports students during the transition to HE in terms of achievement and retention in the course programme. To do so, we used recently obtained questionnaire data administered at two time points (Nt1 = 204; Nt2 = 141) linked to student background information and objective achievement data obtained from the university's educational research database. First analyses, using linear regression modelling, showed that sense of belonging and perceiving senior teachers as role models were positively related to professional identity development in the first year, both for ethnic majority and minority students. Perceiving junior teachers as role models did not contribute to professional identity development. Analyses further indicated that students with a stronger professional identity had a higher intention to continue their studies in the law field. Further analyses will be performed with the data from the university' educational research database, using structural equation modelling.

Doctoral graduates in the eye of employers outside academia
Keywords: Attitudes and Beliefs, Doctoral Education, Quantitative Methods, Researcher Education
Presenting Author: Lien Wille, Ghent University, Belgium; **Co-Author:**Anneleen Mortier, Ghent University, Belgium; **Co-Author:**Katia Levecque, Ghent University, Belgium

Doctoral graduates play a crucial role in economic growth (Cyranoski, Gilbert, Ledford, Nayar, & Yahia, 2011) as well as innovation creation and diffusion (Garcia-Quevedo, Mas-Verdú, & Polo-Otero, 2012). Doctoral graduates may fulfill this role from a job in academia, but also from a non-academic job (Mortier, Levecque, & Debacker, 2020). The transition to the non-academic labor market and the difficulties associated with it have been researched from the doctoral graduates' perspective. The other side of mobility from academia, the employer-side, is however often overlooked (Wille, Legrand, Mortier, & Levecque, 2020). Nevertheless, employers' perceptions of doctoral graduates may present barriers hindering doctoral graduates' transition to the non-academic labor market. The limited number of studies that focused on how non-academic employers think about doctoral graduates indicate that they hold positive and negative stereotypes concerning doctoral graduates' knowledge, skills, abilities, and personal characteristics (CFE research, 2014; Stassen, Levecque & Anseel, 2016). However, these studies are outdated and/or based on limited responses, leaving little room to distinguish between different types of employers. The research aim is hence to gain insights into the perceptions of employers outside academia regarding the skills of doctoral graduates and whether these perceptions differ depending on employer characteristics. Findings will be presented at the conference. The results will (1) help universities to change their doctoral training into outstanding programs that consider non-academic employers perceptions and (2) inform doctoral candidates and graduates on what skills they need to develop to a further extent when aiming for a job outside academia.

Students' Intentions to Enrol in Higher Education: The Multilevel Effects of Grade Retention
Keywords: At-risk Students, Educational Policy, Engagement, Higher Education
Presenting Author: Natalie de Nóbrega dos Santos, ISPA-Instituto Universitário, Portugal; **Co-Author:**Vera Monteiro, ISPA- Istituto Universitário, Portugal; **Co-Author:**Carolina Carvalho, UIDEF, Instituto de Educação da Universidade de Lisboa, Portugal

Higher education has become an increasingly valued instrument for social cohesion and democracy and a central element of economic stability and development. The present study aimed to explore the impact of grade retention and schools' retention composition on students' intention to enrol in higher education. Additionally, we studied the mediation effects of students' school identification and behavioural engagement on the relationship between grade retention and students' intention to enrol in higher education at the individual level. We used a probabilistic, multi-stage sample of 1089 students from the 6^{th} to 10^{th}grade level, spread over 45 public schools in Portugal. The multilevel probit regression model with random intercept and fixed slopes showed that retained students were less likely to enrol in higher education. Furthermore, students in schools where there was a higher proportion of retained students had a lower probability of intent to enrol in higher education. This association was mediated at the individual level by students' school identification. Students retained presented lower levels of school identification, resulting in a lower probability of intention to enrol in higher education. Students' behavioural engagement was related neither to grade retention nor to students' intentions. Our findings suggest that attending higher education could be supported by finding alternatives to grade retention and creating a supportive classroom environment that fosters students' school identification.

Career-related perceptions of the Atidim program graduates
Keywords: Higher Education, Interest, Science and STEM, Self-efficacy
Presenting Author: Or Shav-Artza, Technion, Israel; **Co-Author:**Shahaf Rocker Yoel, Technion, Israel; **Co-Author:**Yehudit Judy Dori, Technion and Samuel Neaman Institute, Israel

In response to the severe shortage of science and technology personnel in Israel, the Atidim (Futures) program was established in 1999 with the aim of increasing the number of populations from under-represented groups who choose a scientific or technological career as a three-year national service. The goal of the current research is to investigate the perceptions of the Atidim graduates about choosing a career in science, technology, engineering, mathematics, or medicine (STEMM). The theoretical framework of this study is based on the social-cognitive theory (SCT), the social-cognitive career theory (SCCT), and the theory of justice of Rawls. Examining 215 Atidim graduates, we identified five new factors that combine the three theories and the relations between the factors that influence the choice and persistence in scientific and technological career at an early age among under-represented groups in academia. Results showed that self-efficacy with respect to family-work balance is in line with SCT and SCCT, and social justice is served by narrowing the gap between central and peripheral populations, both culturally and economically.

Academic Writing Interventions in Higher Education: A Systematic Review
Keywords: Higher Education, Synergies between Learning / Teaching and Research, Teaching/Instructional Strategies, Writing/Literacy
Presenting Author: Julianne van Meerten, University of Maryland, United States

In this systematic review, academic writing interventions in higher education are analyzed for academic writing genre, types of intervention and instructional features, and overall effectiveness regarding undergraduate students' academic writing. Interventions included in the review are empirical studies conducted in a classroom environment that employed an academic writing outcome measure. Preliminary findings regarding academic writing genres, types of intervention, and patterns regarding instructional features are discussed. Conclusions of the review will serve both researchers and practitioners regarding what has been done in the field of academic writing in higher education, as well as practical recommendations for supporting undergraduates' academic writing in instructional practice.

Session O 26

25 August 2023 17:00 - 18:30
UOM_GYM
Roundtable

Teaching and Teacher Education

Communities of Learners/Practice and Teacher Effectiveness

Keywords: Classroom Assessment, Communities of Learners and/or Practice, In-service Teachers, Qualitative Methods, Synergies between Learning / Teaching and Research, Teacher Effectiveness, Teacher Efficacy, Teacher Professional Development, Teaching/Instructional Strategies, Tool Development
Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development
Chairperson: Jolien Quinten, Hogeschool PXL, Belgium

How Data Literate Is My School Team? Designing An Instrument To Measure Data Literacy
Keywords: Communities of Learners and/or Practice, Teacher Efficacy, Teacher Professional Development, Tool Development
Presenting Author: Ariadne Warmoes, Vrije Universiteit Brussel (VUB), Belgium; **Co-Author:**Iris Decabooter, Hasselt University, Belgium; **Co-Author:**Els Consuegra, Vrije Universiteit Brussel, Belgium; **Co-Author:**Katrien Struyven, Hasselt University / Vrije Universiteit Brussel, Belgium; **Co-Author:**Roos Van Gasse, University of Antwerp, Belgium

Research shows that educators' decisions are best based on expertise and data, often referred to as the process of *data use*. Educators' data literacy is an important enabler for effective data use (e.g. Schildkamp & Kuiper, 2010). However, these competences appear to be poorly developed in schools. Collaborative inquiry is considered essential, because it can make up for an educators' lack of data literacy (Schildkamp & Kuiper, 2010). As data use is proven to be a collective process, the question arises if the different competences of data literacy should be present in a school team, rather than individuals being proficient in all of the competences. Current data literacy instruments measure individuals cognitive data skills and not the team's capability of applying systematic data use (Ansyari et al., 2020). In this roundtable we present a conceptual instrument to measure school teams' data literacy. The instrument is based on analyzing school teams' data discussions around hypothetical data scenarios. This contributes to the need of a measurement instrument for data literacy that captures its complex and collective construct. ReferencesAnsyari, M. F., Groot, W. & De Witte, K. (2020). Tracking the process of data useprofessional development interventions for instructional improvement: A systematic literature review. Educational Research Review, 31, 100362. https://doi.org/10.1016/j.edurev.2020.100362
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Instructional Quality in Economics Education
Keywords: Classroom Assessment, In-service Teachers, Teacher Effectiveness, Teaching/Instructional Strategies
Presenting Author: Stefanie Findeisen, University of Konstanz, Germany; **Co-Author:**Patricia Köpfer, University of Hohenheim, Germany; **Co-Author:**Liane Platz, University of Konstanz, Germany

Classroom instruction is often described as the core business of teachers. Therefore, instructional quality has become a strong focus of empirical research. General, subject-independent characteristics of teaching quality (three generic dimensions cognitive activation, constructive support, and classroom management have become established) are now considered to be quite well studied. Quite recently, it is being discussed whether these quality aspects are applicable across subjects and how the framework of instructional quality needs to be adapted for different domains. However, there are still hardly any findings on subject-specific characteristics of teaching quality. The present study addresses this research gap and investigates instructional quality in economics education. We implement a video study in economic classrooms of ten teachers with their 280 students. We follow each class over the course of eight lessons. Both teachers and students are surveyed prior to the first lesson and after the eighth lesson. In the analyses we specifically combine the basic dimensions of general instructional quality with subject-specific aspects (e.g., use of action-oriented methods; fostering students' ability to assess economic situations from different (contradictory) perspectives). We also pay specific attention to classroom activities that are typically regarded as subject-specific (e.g., explaining content, handling student errors). In addition, we are interested in the stability of different quality aspects over the course of several lessons and in differences and commonalities in the perception of different perspectives (students, teachers, and observers). Finally, we relate instructional quality to students' learning both in a post-test and in the next exam.

Practice-based educational research: making practice-research activities part of teacher's work
Keywords: Communities of Learners and/or Practice, Qualitative Methods, Synergies between Learning / Teaching and Research, Teacher Professional Development
Presenting Author: Anna Åkerfeldt, Stockholm University, Sweden; **Co-Author:**Sylvana Sofkova Hashemi, University of Gothenburg, Sweden

An international trend in educational policy aims to stimulate links between educational research and practice (Wyse et al, 2018) with the purpose to develop, and understand how things work in a classroom rather than strive for a fixed solution. Research projects from this perspective have varied theoretical and methodological approaches and different study designs such as action research, design-based research, intervention, and learning study. One challenge in practice-based educational research is to achieve collaboration between practitioners and researchers that works and is part of the teachers' regular tasks and everyday work: what is meant and expected by collaboration, how is it planned for, what roles are possible, and desirable, for teachers to take and, how do teachers develop and perceive the possibilities of agency and ownership in research and work? This round table invites scholars to take part in a discursive explorative discussion on these issues starting with an example from an ongoing Swedish research project Teachers' meta knowledge and assessment practices in digital, multimodal learning environments, that applies a Design-Based Research research approach (Ball, 2004; McKenney & Reeves, 2019). ReferencesBall, P. (2004). On the Theoretical Breadth of Design-Based Research in Education. Educational Psychologist, 39(4), 243-253. https://doi.org/10.1207/s15326985ep3904_6McKenney, S. & Reeves, T. C. (2019). Conducting Educational Design Research. 2nd ed, London: Routledge.Wyse, D., Brown, C., Oliver, S., & Poblete, X. (2018). The BERA close-to-practice research project: Research report.

Session O 27

25 August 2023 17:00 - 18:30
UOM_A11
ICT Demonstration

Translating evidence into practice: A clearinghouse approach for (pre-service) teacher education

Keywords: E-learning/ Online Learning, Pre-service Teachers, Teacher Professional Development, Teaching Approaches
Interest group: SIG 11 - Teaching and Teacher Education

Please bring your own device if you are attending this ICT demonstration.The purpose of the *"Clearing House Unterricht (Engl.: Teaching)"* project *(CHU)* is to provide a link between research and practice in teacher education. With the *CHU*, we want to support evidence-based decision-making and practice for teacher educators, (pre-service) teachers and interested educators by informing them about recent and relevant educational research evidence in a targeted way. The central product of the *CHU* is a public service platform that offers access to recent educational research evidence in various formats (e.g., short summaries, podcast, and glossary). The development and design of these formats follow quality standards, which we developed according to literature and user feedback. The material can be used as learning tools in a course or as part of a self-study for teacher students, or anyone else who wants to expand their knowledge on effective teaching.With the newly founded *CHU-Academy* we developed a digital learning environment, which aims at further facilitating teacher educators in working with the *CHU* formats and educational research evidence. The *CHU-Academy* introduces the basics and background of empirical educational research: from experimental research to the proper interpretation and classification of effect sizes. Further courses focus on effective teaching strategies, such as inquiry learning, flipped classroom, etc. Both understanding and implementing research evidence paves the way for evidence-based teacher education and, in turn, for the implementation of evidence-based teaching. During the ICT-Demonstration we will give insights into the materials (specifically, the *CHU*-short summaries) and the *CHU-Academy* learning platform with its course offerings.

Translating evidence into practice: A clearinghouse approach for (pre-service) teacher education
Presenting Author: Annika Diery, Technical University of Munich (TUM), Germany; **Co-Author:**Claudia Müller-Kreiner, Technische Universität München (TUM), Germany; **Co-Author:**Meg Farrell, Technische Universität München, Germany; **Co-Author:**Anastasia Asiedu, Technische Universität München (TUM), Germany; **Co-Author:**Doris Holzberger, Technical University of Munich (TUM) & ZIB (Centre for International Student Assessment), Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany

Please bring your own device if you are attending this ICT demonstration.The purpose of the *"Clearing House Unterricht (Engl.: Teaching)"* project *(CHU)* is to provide a link between research and practice in teacher education. With the *CHU*, we want to support evidence-based decision-making and practice for teacher educators, (pre-service) teachers and interested educators by informing them about recent and relevant educational research evidence in a targeted way. The central product of the *CHU* is a public service platform that offers access to recent educational research evidence in various formats (e.g., short summaries, podcast, and glossary). The development and design of these formats follow quality standards, which we developed according to literature and user feedback. The material can be used as learning tools in a course or as part of a self-study for teacher students, or anyone else who wants to expand their knowledge on effective teaching.With the newly founded *CHU-Academy* we developed a digital learning environment, which aims at further facilitating teacher educators in working with the *CHU* formats and educational research evidence. The *CHU-Academy* introduces the basics and background of empirical educational research: from experimental research to the proper interpretation and classification of effect sizes. Further courses focus on effective teaching strategies, such as inquiry learning, flipped classroom, etc. Both understanding and implementing research evidence paves the way for evidence-based teacher education and, in turn, for the implementation of evidence-based teaching. During the ICT-Demonstration we will give insights into the materials (specifically, the *CHU*-short summaries) and the *CHU-Academy* learning platform with its course offerings.

Session O 28

25 August 2023 17:00 - 18:30
UOM_R02
Poster Presentation
Cognitive Science, Higher Education, Teaching and Teacher Education

Teaching Approaches

Keywords: Assessment Methods, Citizenship Education, Higher Education, Knowledge Construction, Pre-service Teachers, Qualitative Methods, Science Education, Teacher Effectiveness, Teacher Efficacy, Teacher Professional Development, Teaching Approaches, Teaching/Instructional Strategies
Interest group: SIG 03 - Conceptual Change, SIG 04 - Higher Education, SIG 13 - Moral and Democratic Education
Chairperson: Christa Krijgsman, Netherlands

Enhancing GTAs' questioning techniques in a mandatory training course
Keywords: Pre-service Teachers, Teacher Effectiveness, Teacher Efficacy, Teaching/Instructional Strategies
Presenting Author: Peter Fat Man Lau, The University of Hong Kong, China

This action research aimed to explore whether a new implementation in a mandatory training course could enhance graduate teaching assistants' (GTAs) questioning techniques. Based on the three modeling stages of Chen's (2016) theoretical framework, implementation was designed. It included an interactive quiz using a game-based online tool (*teacher questioning stage*), a debriefing to reinforce the concept of effective questioning techniques (*group discussion stage*) and a guided reflection to identify mistakes in questioning techniques and to revise questions (*student question generation stage*). 37 and 38 students participated in two cycles respectively. Implementation was only introduced in the second cycle. All participants completed a pre-survey on self-confidence about their teaching skills. Their final micro-teachings were observed and assessed by the same instructor using the same rubric. Thematic analysis was used to analyse instructor's feedback and students' reflection.The pre-survey results showed that all participants were not confident in teaching and crafting questions. Independent sample *t*-test to the pre-survey data showed no significant difference between the two groups. Four issues relating to questioning techniques were identified in their initial teaching practice. After training, participants experiencing implementation demonstrated higher achievement in micro-teaching. Positive significant changes were identified in two assessment criteria (Interactivity and Alignment). Quantitative and qualitative findings suggested that effective questioning techniques could be developed through Chen's (2016) three modeling stages: *teacher questioning*, *group discussion* and *student question generation*. Improved questioning techniques may also enhance GTAs' teaching skills by promoting meaningful interactions in class and strengthening the alignment between assessment and learning outcomes.

Students' participation: how it is understood and experienced by second-year teacher students
Keywords: Citizenship Education, Qualitative Methods, Teacher Professional Development, Teaching Approaches
Presenting Author: Irina Ivashenko Amdal, University of Agder, Norway; **Co-Author:**kristin endresen-maharaj, University of Agder, Norway

Teacher education institutions are responsible for qualifying teachers who can work in a democratic society. One of the crucial preconditions for this qualification is to present students with opportunities to participate in their education. In this study, we use the concept of student participation to investigate how second-year teacher students in Norway understand and experience their participation in the construction of seminars. This study was conducted on the background of a semester where teacher educators systematically collected feedback from students and used this information to construct their seminars. The data material consists of 38 reflection notes that students wrote at the end of the semester. Students were asked to reflect on four questions regarding their understanding and experience of participation during the semester. Results of the study shed light on teacher students' understanding of participation as an opportunity for influencing the seminar content as well as students' realization of their responsibility for learning. Moreover, teacher students experience participation as an opportunity to demonstrate their capability to contribute with subject-relevant content in the constructing and shaping seminars. The results also shed light on crucial preconditions for participation, namely, teacher educators' initiative and teacher students' willingness to participate.

Faculty participation in discipline-based education research in the neoliberal university
Keywords: Higher Education, Qualitative Methods, Science Education, Teaching Approaches
Presenting Author: Trisha Douin-Manning, University of Louisville, United States; **Co-Author:**Raymond Chastain, University of Louisville, United States; **Co-Author:**Jeffrey Hieb, University of Louisville, United States; **Co-Author:**Marci DeCaro, University of Louisville, United States; **Co-Author:**Linda Fuselier, University of Louisville, United States

Neoliberal ideology impacts components of the academy that have shaped teaching and learning in science and the trajectory of higher education in general. Concordant with this ideology is the increasing dependence on faculty in temporary or non-tenure-track faculty positions (NTT). We used institutional ethnography to interrogate institutional texts at a USA university for the infiltration of neoliberalism and to uncover impacts of this ideology upon choices to participate in discipline-based education research (DBER). Discourse analysis of institutional texts revealed guidance by neoliberal ideology at multiple levels. The interaction of academic position, department culture, and teacher-researcher identity emerged as central to understanding how NTT and TT professionals navigate the neoliberal university and still invest in DBER.

Teachers' implicit and explicit knowledge of learning in daily classroom pedagogy
Keywords: Assessment Methods, Knowledge Construction, Teaching Approaches, Teaching/Instructional Strategies
Presenting Author: Erik Meij, Windesheim University of Applied Sciences, Netherlands; **Co-Author:**Martijn Meeter, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Anneke Smits, Windesheim University, Netherlands

It is evident that teachers should know something about how learning happens. However, we know from the literature that daily pedagogical reasoning is more often based on experience, beliefs and intuition rather than on theory. Nevertheless there might be implicit ideas and convictions that do comply with scientific principles of learning and that are used subconsciously. We investigated whether it is possible to examine if these implicit ideas comply with learning

principles.We designed a test that consists of four components differing from more implicit to more explicit assessment of how much teachers knew of or relied on principles of learning. The test was made online by more than 300 pre- and in-service teachers and researchers in secondary education. All four components were based upon ten basic principles of learning taken from APA's consensus group's list, five covering a more cognitive and five a more affective content.Participants' answers were correlated for explicit and implicit measures, within cognitive and affective principles and also for each principle. Correlations were found between reaction times and positive recognition of words, self scored extend of conviction and the use of principles in describing situations.

Session P 1

25 August 2023 18:45 - 20:15
HELEXPO_CC
Invited Symposium

Process Measures in the era of Artificial Intelligence

Keywords: Artificial Intelligence, Comprehension of Text and Graphics, Computer-assisted Learning, Cooperative/Collaborative Learning, Health-care Education, Immersive Technologies for Learning, Learning Analytics, Reading, Self-regulated Learning and Behaviour
Interest group: SIG 27 - Online Measures of Learning Processes
Chairperson: Kshitij Sharma, Norwegian University of Science and Technology (NTNU), Norway
Organiser: Leen Catrysse, Belgium
Discussant: Kshitij Sharma, Norwegian University of Science and Technology (NTNU), Norway

Artificial intelligence (AI) brings novel opportunities to analyze multi-channel process data to gain new insights into learning processes and how to support these learning processes. The use of AI in educational research presents both opportunities and challenges. On the one hand, AI can enable researchers to process large amounts of data and perform complex analyses, leading to new insights and a deeper understanding of educational phenomena. For example, AI can be used to analyze student process and performance data to identify factors that impact learning processes and outcomes. AI can also be used to personalize learning experiences, making education more effective and efficient. On the other hand, the use of AI in educational research also presents a number of challenges. One of the main challenges is the need for high-quality and representative data sets, as AI algorithms can only be as good as the data they are trained on. Additionally, the interpretation of AI-generated results can be difficult, and it is important to ensure that AI-generated insights are valid and reliable. The ethical implications of using AI in education also need to be carefully considered, particularly with regards to data privacy and the potential for algorithmic bias. This symposium intends to gain a better understanding of how to apply AI to measure learning processes, how to integrate AI in intelligent and adaptive learning technologies and how to align findings from AI with current learning theories taking both opportunities and challenges into account.

Unfolding Socially Shared Regulation of Learning Processes with Multimodal Data and AI
Presenting Author: Andy (Khanh Xuan) Nguyen, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland; **Co-Author:**Carolyn Rose, Carnegie Mellon University, United States

Artificial Intelligence (AI) has the potential to greatly enhance research on socially shared regulation of learning (SSRL), which focuses on the collaborative and interactive processes that underlie the regulation of cognition, emotion, and behavior in collaborative learning. In this paper, we demonstrate, through empirical evidence, our progress in advancing SSRL research with AI. We specifically highlight the use of AI for automated coding and analysis of behavioural and physiological data, social interactions, and computational models to predict SSRL. The advantages of using AI in SSRL include the ability to quantify and analyse data at a large scale, improved precision and accuracy, and the creation of virtual social interactions for experimental manipulation. However, the use of AI in SSRL research also poses some challenges, such as ensuring the validity and reliability of AI-generated data, and the ethical implications of using AI to study human behaviour. To overcome these challenges, interdisciplinary collaboration between researchers in learning sciences, AI, and related fields is essential. This would allow the integration of theoretical and methodological advances from multiple fields and ensure that the AI-generated data and models are valid, reliable, and interpretable. Overall, this paper provides an overview of the possible benefits and challenges of using AI in socially shared regulation research and serves as a call for further development and application of AI in this field, which could benefit the ability to understand and facilitate effective learning processes for SSRL.

Using AI and Multimodal SRL Trace Data to Augment Clinical Reasoning with Holoportation Technology
Presenting Author: Roger Azevedo, University of Central Florida, United States; **Co-Author:**Megan Wiedbusch, University of Central Florida, United States; **Co-Author:**Daryn Dever, University of Central Florida, United States; **Co-Author:**Bari Hoffman, University of Central Florida, United States

Across health professions, clinical reasoning has been taught and assessed using various technologies ranging from simulations to high-fidelity mannequins. Our paper focuses on using AI and multimodal self-regulated learning trace data to augment clinical reasoning with innovative holoportation technologies. In this session, we will (1) provide the theoretical bases for collecting clinicians' multimodal self-regulated learning (SRL) data during diagnostic tasks using a specific holoportation technology; (2) illustrate, using trace data, the challenges associated with detecting, inferring and modeling clinicians' multimodal data, and, (3) discuss challenges associated with using current AI techniques to detect, analyze, and infer the underlying SRL processes (e.g., clinical reasoning strategies) that can subsequently be fed back using both static and dynamic representations of their multimodal data with the assistance of embedded artificial agents (e.g., intelligent virtual humans) onto the interface of the teleportation technology to model, scaffold, and augment clinical reasoning.

Reading Comprehension of Causal Relations With Diagrams: Toward Automated Feedback of Sequence Order
Presenting Author:Héctor J. Pijeira-Díaz, Maastricht University, Netherlands; **Co-Author:**Shashank Subramanya, Maastricht University, Netherlands; **Co-Author:**Janneke van de Pol, Utrecht University, Netherlands; **Co-Author:**Anique de Bruin, Maastricht University, Netherlands

Students struggle to understand causal relation chains (i.e., what implies what) in expository texts and have inaccurate judgments of their own comprehension (i.e., metacomprehension). An intervention requiring them to complete empty pre-structured diagrams helps to improve their metacomprehension to a certain extent but not their reading comprehension. Previous studies on this diagramming intervention show that students place about half of their correct diagram answers in the wrong order in the causal relation chain. We hypothesize that automated feedback of sequence order of causal relations can scaffold their self-regulated learning processes for better metacomprehension and reading comprehension. To enable testing this hypothesis in an upcoming study, in this study we test how accurate and reliable such feedback would be by leveraging advances in natural language processing (NLP) on the mathematical representation of texts. We compare two NLP approaches based on semantic similarity to estimate the correct sequence order in causal relation chains and evaluate them using data from previous diagramming experiments where the sequence order was rated by two human coders with an interrater reliability of Cohen's kappa = 0.84. An accuracy of up to 89% was obtained for the automated sequence order estimation, and a kappa of 0.84 for human-computer, which matches the human-human reliability. Other standard NLP performance metrics are reported. These results enable testing in a following study whether providing automated feedback on the sequence order of causal relation diagrams enhances students' metacomprehension and reading comprehension.

Using Learning Analytics and Artificial Intelligence (AI) to Scaffold Self-Regulated Learning
Presenting Author: Joep van der Graaf, Radboud University Nijmegen, Netherlands; **Co-Author:**Mladen Raković, Monash University, Australia; **Co-Author:**Yizhou Fan, Peking University, China; **Co-Author:**Lyn Lim, Technical University of Munich, Germany; **Co-Author:**Shaveen Singh, Monash University, Australia; **Co-Author:**Johanna Moore, The University of Edinburgh, United Kingdom; **Co-Author:**Dragan Gasevic, Monash University, Australia; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands

Students' ability to regulate their own learning within technology-enhanced learning environments (TELs) is increasingly important. Prior research has shown that self-regulated learning (SRL) leads to better learning performance but students often experience difficulties to adequately self-regulate their learning. Instructional scaffolds are a successful method to help learners and consequently improve learning outcomes. However, scaffolds are often standardized and do not adapt to individual SRL processes. Learning analytics and artificial intelligence offer novel ways to better measure and understand SRL during learning. This improved insight in SRL and usage of scaffolds can consequently be used to improve the design of personalised scaffolds. In this study, we designed

generalised scaffolds which were the same for all students and personalised scaffolds which were based on individual SRL process as detected by the FLORA algorithm. Although we have found no difference in learning outcomes between conditions, we found differences in SRL processes. Specifically, students with personalised scaffold showed more high cognition and monitoring compared to the control condition and compliance with the scaffolds was related to improved learning outcomes. Hence, results showed that scaffolds affect SRL processes and when learners comply also improve learning outcomes. We discuss these results in light of future use of Artificial Intelligence to further personalise scaffolds for SRL and improve the efficacy of scaffolds.

Session P 2

25 August 2023 18:45 - 20:15
UOM_CH
Invited Symposium
Cognitive Science, Learning and Social Interaction

Recent advances of eye-tracking methods applied in educational research

Keywords: Artificial Intelligence, Classroom Management, Cognitive Skills and Processes, Comprehension of Text and Graphics, Eye Tracking, Mathematics/Numeracy, Pre-service Teachers, Teacher Professional Development, Well-being
Interest group: SIG 27 - Online Measures of Learning Processes
Chairperson: Markku Hannula, University of Helsinki, Finland
Discussant: Marjaana Puurtinen, University of Turku, Finland

Recent advances in eye-tracking research include the development of mobile (wearable) eye-tracking devices (eye-tracking glasses) that can be used in natural contexts as well as Artificial Intelligence (AI) to facilitate data analysis and to gain novel insights from eye movement data. Mobile eye tracking allows researchers to study behavior of active participants in ecologically valid contexts, with natural social interactions and multimodal sources of information. AI, on the other hand, will not only facilitate the pervasive adoption of eye tracking in education practice but also facilitates the data analysis in interaction with human researchers and allows to extract novel insights for the extremely rich eye-movement data that typically has hundreds of data points per minute of data. Two of the symposium presentations will use eye-tracking for investigating teacher's visual attention as part of their decision-making process. One of these studies uses mobile eye trackers, the other uses static eye-tracker and the discussion will focus on the new affordances of mobile device. The other two presentations will focus on how AI algorithms can assist in identifying student understanding and their strategies working on mathematical tasks.

Histogram recognition - An algorithmic model of eye movement
Presenting Author: Markku Hannula, University of Helsinki, Finland; **Co-Author:**Enrique Garcia Moreno-Esteva, University of Helsinki, Finland; **Co-Author:**Lonneke Boels, Utrecht University, Netherlands

Histograms are omnipresent in research and media. For example, Google Scholar returns over 3.2 million hits for 'histogram' (January 9, 2023). However, students persistently confuse histograms with value bar charts leading to misinterpreting mean and variation in histograms. This could be solved by providing students *immediate* personalized feedback but such feedback requires that students' recognition success or failure can be instantly determined by a model. For this aim, we developed an interpretable mathematical model (IMM) to explain eye movements during histogram recognition tasks based on a qualitative study in which we collected eye movements of fifty upper secondary students during 25 recognition tasks with statistical graphs, including value bar charts and histograms. The purpose of the IMM is to determine whether students succeeded in recognizing histograms or whether they interpreted the histogram as if it was a value bar chart. The IMM is much faster than our machine learning algorithm (MLA) in classifying the data into students' successful and unsuccessful recognition of histograms. In addition, the IMM does not need any training. Moreover, the IMM allows the determination of possible success or failure in real time as the recognition task is in process. Given our aim, the algorithm compares favorably with a MLA baseline. This makes it possible to use the IMM with a computer screen fitted with an eye tracking device to provide feedback to students in real time.

Visual expertise in teachers' classroom management – a mobile eye tracking study
Presenting Author: Halszka Maria Jarodzka, Open Universiteit, Department of Online Learning and Instruction, Netherlands; **Co-Author:**Sharisse van Driel, Open University, Netherlands; **Co-Author:**Leen Catrysse, Open Universiteit, Department of Online Learning and Instruction, Belgium; **Co-Author:**Frank Crasborn, Fontys University of Applied Sciences, Netherlands

Teachers must manage complex classroom situations in their daily practice. This is key to students' learning. However, preservice and beginning teachers struggle with classroom management. One key prerequisite for successful classroom management is that teachers notice visual cues indicative for potential classroom management issues and that they interpret these cues correctly. This skill is often referred to as visual expertise. In the current study, we compared 22 preservice, 17 beginning, and 19 experienced teachers' visual expertise. These teachers taught their own classes while wearing mobile eye tracking glasses. Our initial analyses showed that, first, teachers did not differ in their total count of visual intakes. That means that we found no relation between the efficiency of visual processes and teaching experience. Second, beginning teachers had marginally longer average durations of visual intakes compared to preservice teachers. This indicates a tendency of preservice teachers to experience more mental effort compared to beginning teachers. Third, experienced teachers had marginally more dispersed visual intakes compared to preservice teachers. This finding indicates that experienced teachers have larger visual spans than preservice teachers. Our findings shed rare insights into the visual expertise of a larger population of teachers during authentic teaching of their own classrooms. In further steps, we will dive more into different parts of the lesson (e.g., beginning, switching of work forms) and different elements of the classroom (e.g., pupils, teaching material) to gain more detailed insights into teachers' visual expertise in their educational practice.

What can eye movements reveal about the cognitive processes underlying teachers' diagnoses?
Presenting Author: Sara Becker, Freiburg University of Education, Germany; **Co-Author:**Andreas Obersteiner, Technical University of Munich, Germany; **Co-Author:**Anika Dreher, University of Freiburg, Germany; **Co-Author:**Birgit Spinath, Heidelberg University, Germany; **Co-Author:**Tobias Dörfler, Heidelberg University, Germany

Mathematics teachers' diagnostic competence includes the ability to identify and interpret features of mathematical tasks that make them potentially difficult for students to solve. In real classroom situations, teachers' cognitive capacities may be limited due to external factors such as stress, making diagnostic processes more challenging. So far, little is known about the influence of stress on teachers' cognitive processes of perceiving and interpreting mathematical task features. In an experimental study, we investigate the influence of stress on the cognitive processes underlying teachers' diagnoses of mathematical word problems with fractions. The sample consisted of 64 pre-service secondary mathematics teachers. Participants' perceptions were measured using eye tracking, and interpretation (i.e., their reasoning about task features) were measured using verbal protocols. The results suggest that under stress, participants' perceptual processes were impaired. Furthermore, the results indicate that under stress, attention can still be directed to potentially relevant task features, but that further interpretation processes of the features were impaired. The results highlight the importance of the triangulation of eye tracking and verbal data

Using eye tracking and AI to identify student strategies: Illustrated by studies in math education
Presenting Author: Maike Schindler, Universität zu Köln/ University of Cologne, Germany; **Co-Author:**Erik Schaffernicht, Örebro university, Sweden, Sweden; **Co-Author:**Anna Lisa Simon, Universität zu Köln/ University of Cologne, Germany; **Co-Author:**Parviz Asghari, Universität zu Köln/ University of Cologne, Germany; **Co-Author:**Achim J. Lilienthal, TU Munich, Germany

In mathematics education and beyond, it is crucial for researchers and teachers to investigate not only students' performance and outcomes but also the cognitive processes and strategies that lead to those results. Our paper presents an innovative approach to facilitate the analysis of student strategies: using Artificial Intelligence (AI) to support researchers. This is particularly useful for the laborious analysis of large datasets. We present two studies in mathematics education where we used eye tracking in combination with AI to identify student strategies. Specifically, we used AI-enhanced analysis of gaze heatmaps by applying clustering (unsupervised machine learning) to partition the data such that the heatmaps in each cluster are similar in appearance to each other, yet dissimilar to the heatmaps in other clusters. This approach provides an independent perspective on the data. For analysis of student strategies, the AI

suggestions are then interpreted by human experts who use their content knowledge to assign student strategies to the suggested clusters. In our paper, we illustrate the power of combining eye tracking and AI by two studies: One study investigated student strategies in small number enumeration, the other one student strategies in number line estimation. In both studies, we were able to find meaningful strategies based on the suggestions by the AI. Further, we were able to find significant group differences in the identified strategy use by, for example, students with and without mathematical difficulties.

Session P 3

25 August 2023 18:45 - 20:15
AUTH_CH
Invited Symposium
Learning and Instructional Technology

Multimodal analytical approaches in researching collaborative problem solving

Keywords: Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Educational Technologies, Higher Education, Learning Analytics, Problem Solving, Secondary Education, Self-regulated Learning and Behaviour, Simulation-based Learning
Interest group: SIG 04 - Higher Education, SIG 27 - Online Measures of Learning Processes
Chairperson: Crina Damsa, University of Oslo, Norway
Organiser: Hanni Muukkonen, University of Oulu, Finland
Discussant: Nikol Rummel, Ruhr University Bochum, Germany

Collaborative problems solving is a key process to addressing complex problems in education and work. CPS has been shown to facilitate increased learner engagement and learning of both knowledge and skills through the exchange of verbal and non-verbal cues and higher-quality communication processes, which enables shared understanding and completion of difficult tasks as a group/team. Understanding CPS still poses a challenge for research and supporting learners in the process is dependent of understanding both the micro-level aspects of collaboration and the (inter)disciplinary contents teams work with. As new technologies and methods emerge in the field of capturing and analysing digital and co-located collaboration, new opportunities arise to both study CPS and to facilitate students to learn and solve problems collaboratively. This symposium presents research work that feature multimodal collaborative analytics, and aims at generating knowledge and analyses that build on hybrid analytical accounts to better understand CPS. It highlight existing approaches to analysing collaborative processes and products based on analytics of verbal interactions, but also of individual actions, physical positioning and movement, manipulation of tools. While holding potential to disclose aspects of collaboration in CPS that are not accessible through regular observation, integration of different data streams and with qualitative accounts of collaboration still represent a methodological challenge. The contributions in this symposium each present and discuss solutions that can bring an additional input to how we can understand collaboration by using a multimodal lens.

Multimodal collaboration analytics in collaborative problem solving – a scoping review
Presenting Author: Rachelle Esterhazy, University of Oslo, Norway; **Co-Author:**Rogers Kaliisa, University of Oslo, Faculty of Education, Norway; **Co-Author:**Daniel Sanchez, University of Oslo, Norway; **Co-Author:**Malcolm Langford, Fcaulty of Law, UiO, Norway; **Co-Author:**Crina Damsa, University of Oslo, Norway

This study presents a scoping review on multimodal collaboration analytics (MMCA). Guiding and assessing students as they work in collocated collaboration is a challenging and time-consuming task for teachers. This is related to the complex simultaneous interplay of multiple modalities during collaborative learning situations, which are challenging to capture and process in a reliable manner. In recent years, advancing technology has made it possible to develop approaches to analyze and support students' collaborative learning by means of multimodal collaboration analytics. Using a scoping review of 65 studies, we provide an overview of MMCA literature by analyzing thematic, conceptual, and methodological approaches as well as empirical and practical contributions. Our findings show that several studies (N=10) refer to well-established frameworks on collaborative problem solving (CPS). In addition, 15 studies establish links to learning theory by using concepts from specific theoretical traditions. Most prominent are socio-constructivist and socio-cognitivist traditions. The remaining studies build primarily on empirical or practical literature. Further results provide overviews of modalities and variables used in the empirical studies and how these variables are combined to address collaboration research problems. Based on the results, we identify common challenges and potential solutions presented in the literature.

Monitoring complex collaboration processes in HE contexts: conceptual challenges in data integration
Presenting Author: Hanni Muukkonen, University of Oulu, Finland

Higher education (HE) is expanding its digital ecologies, which is accompanied with an extraordinary growth of data available on collaboration processes. Research on collaborative problem solving takes multiple methodological approaches, focusing, for instance, on interaction, regulation, knowledge creation or competences. In this study, four data types from a course extending six weeks are compared through triangulation, to consider affordances and limitations the data types pose for understanding the processes and outcomes of collaboration.Five iterations of an organizational simulation course are investigated, involving students (N=120) in educational psychology, engineering, economics, humanities, and education. The dataset combines a) qualitative data, i.e., individual diary data and video data on team interaction, b) questionnaire data on knowledge work competence development and personal background, and c) teacher evaluations.The study contributes to building methodological approaches and indicators for monitoring complex collaboration processes in HE contexts. The dataset makes visible, for instance, how an individual diary account of collaboration may highlight personal contributions and agency, even when it does not come equally apparent in a video recording of the collaboration situation. Thus, it may generate contradictory interpretations of personal and shared agency in a situation. Further, present continuous education goals lead to a more varied student background in HE. The question raises how personalized learning paths tailored to varying starting level competences could be available. The dataset triangulates longitudinal and situated evaluations on competence development. The role of mediating digital tools and resources in collaborative problem solving processes is also discussed.

Multimodal learning analytics of collaborative problem solving in embodied teamwork
Presenting Author: Dragan Gasevic, Monash University, Australia; **Co-Author:**Linxuan Zhao, Monash University, Australia; **Co-Author:**Vanessa Echeverria, Monash University, Australia; **Co-Author:**Lixiang Yan, Monash University, Australia; **Co-Author:**Roberto Martinez Maldonado, Monash University, Australia

EEmbodied team learning is a form of group learning that occurs in co-located settings where students need to interact with others while actively using resources in the physical learning space to solve a problem and thus achieve a common goal. In such situations, different processes associated with collaborative problem solving can occur in different locations of the physical space with varied team member configurations. This can make it hard for teachers to assess the effectiveness of teamwork and for students to reflect on their own experiences. In this paper, we present the findings of a research program that aims to harness the potential of multimodal learning analytics to analyse collaborative problem solving of simulation-based learning of embodied learning teams in healthcare education. Specifically, the paper will provide a synthesis of the findings of multimodal learning analytics that(a) made use of indoor positioning data of students in embodied simulation-based learning to (i) uncover relationships between collaborative processes and performance assessment and (ii) differentiate collaborative problem-solving process between low-performing and high-performing teams;(b) combined indoor positioning and audio data to model embodied team communication with ordered network analysis and identify key differences in the communication dynamics of high and low performing teams; and(c) combined team dialogue content with indoor positioning and temporal data to identify key differences between high and low performing teams i) across the whole learning session, ii) at different phases of learning sessions, and iii) at particular spaces of interest in the learning space.

The conditions for collaborative groups' regulation: what multimodal data can showcase?
Presenting Author: Jonna Malmberg, University of Oulu, Finland; **Co-Author:**Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:**Kateryna Zabolotna, University of Oulu, Finland, Finland; **Co-Author:**Tatiana Shubina, University of Oulu, Finland

Coupled with the recent novel process methods, developing a theoretical understanding on socially shared regulation (SSRL) has contributed to possibilities to extend the research focus from the processes of collaborative groups' SSRL to conditions for these processes to emerge. Different data modalities and -

channels can together reveal actualised regulation processes and their temporal interconnections, as well as their contextualised premises at a level of detail and diversity that has not been possible before. This presentation aims to show our recent research that drives to bridge collaborative groups' regulatory activities with the socio-emotional context the collaboration takes place. Despite the evidence that a positive socio-emotional atmosphere is favourable for collaborative learning, there is a lack of research exploring how it relates to metacognitive monitoring that initiates groups' regulation. We address this gap through different data channels implementation for capturing psychophysiological processes alongside the features of interaction (behaviour and speech) on a data sample from 21 collaborative 9th-graders who were to build and program a robotic arm, Alvin. The student's collaborative problem solving was videotaped and included the video recordings of each group and individual audio recordings of each student. Additionally, physiological data (EDA) was recorded. Through this data example, we will demonstrate the role of regulation in groups' problem solving and highlight the role of multimodal methods in studying the role of socioemotional and metacognitive conditions for initiating collaborative groups' regulation.

Session P 4

25 August 2023 18:45 - 20:15
UOM_A02
Symposium
Motivational, Social and Affective Processes

Perceptions of Student Achievement: Insights on Teacher Expectations and Peer Academic Reputations

Keywords: Achievement, Attitudes and Beliefs, Emotion and Affect, Engagement, Motivation, Peer Interaction, Personality, Secondary Education, Self-determination, Social Aspects of Learning and Teaching, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Astrid Poorthuis, Utrecht University, Netherlands
Organiser: Astrid Poorthuis, Utrecht University, Netherlands
Discussant: Tim Mainhard, Leiden University, Netherlands

Academic expectations of significant others influence students' self-beliefs, engagement, and performance at school. Most research has focused on expectations of teachers. It is increasingly recognized that classmates can also be considered "significant others" who have academic expectations of each other (called peer academic reputations). This symposium brings together scholars from the research fields of teacher expectations and of peer academic reputations with the aim to learn from each other's approaches. The aim of this symposium is to address questions on the formation of expectations, the mechanisms through which expectations influence students, and the impact of expectations on others than the student. The first paper addressed the question how expectations are formed. It showed which student characteristics in primary school predicted peer academic reputations in secondary school and whether there was bias in this process. The second paper focused on a possible mechanism through which teacher expectations influence student outcomes. It investigated how teacher expectations may lead to differences in teacher-provided need support and subsequently, students' need satisfaction. The third and fourth paper addressed the question how expectations may influence others than the student. Specifically, the third paper studied whether students with a high peer academic reputation influence their classmates' engagement over time. The fourth paper studied the relation between teacher expectations and teacher emotions in class. After the four paper presentations, the discussant (an expert on classroom social interactions) will reflect on the role of teacher expectations and peer academic reputation in students' educational experiences and directions for future research.

The Formation of Peer Academic Reputations after the Transition to Secondary School
Presenting Author: Astrid Poorthuis, Utrecht University, Netherlands; **Co-Author:**María Belén Casalá, Utrecht University, Netherlands

Students' academic reputations among their peers influence their academic adjustment. How these peer academic reputations are formed in a new peer group is still unknown. This cross-transitional study investigated which student characteristics in primary school shape peer academic reputations in secondary school. Furthermore, this study investigated possible bias in the formation of reputations, by assessing whether peers form their classmates' academic reputations based on the right characteristics (i.e., those that actually predict academic performance) or not. A sample of 322 students (53% female, M_{age} = 12.2) reported on their school engagement, academic self-concept, Big Five personality traits, narcissism, and gender at the end of primary school. Peer academic reputations were assessed within three weeks after the transition to secondary school. Academic performance was measured using grades of the first report card students received. Students' observable characteristics indicative of high performance were those more strongly related to their peer academic reputations than less observable characteristics. Further, results mainly suggested that peers are accurate observers, as they base peer academic reputations on almost all the right characteristics, those that predict actual performance. This study also provides initial evidence that peer academic reputations at the start of secondary school are biased to some extent: academic self-concept and being a girl predicted academic performance, but were not taken into account by peers accordingly. Overall, our findings suggest that peers rapidly perceive their classmates' characteristics to form their academic reputations, which predict their academic performance a few months later.

Differential Need-Support: The Role of Teacher Expectations and Academic Achievement
Presenting Author: Astrid Poorthuis, Utrecht University, Netherlands; **Co-Author:**Iris Boer, Utrecht University, Netherlands; **Co-Author:**Anouke Bakx, Fontys University, Radboud University, Netherlands; **Co-Author:**Janneke van de Pol, Utrecht University, Netherlands

According to Self-Determination Theory, teachers can support their students' motivation and engagement in learning through need-supportive teaching (provision of autonomy support, structure, and involvement). Within classes, however, there appears to be great diversity in the extent to which students' needs are supported by teachers, and subsequently in the extent to which students feel that their needs for autonomy, competence, and relatedness are satisfied. This study aimed to provide more insights into how teacher expectations of their students may be underlying differences in teacher-provided need support and subsequently, students' need satisfaction. A sample of 72 teachers and 585 students participated. Multilevel mediation analyses confirmed that there are large differences within classes in need support. Overall, our findings suggest that teacher expectations play an important role in explaining these differences, especially for autonomy support and structure. That is, teachers differentiated their need support based on their expectations of their students. Even after taking into account actual differences in students' academic achievement, teacher expectations were a medium to strong predictor of need support. Moreover, teacher expectations were directly related to students' competence satisfaction. The findings suggest that teachers tend to adopt a so-called controlling teaching style (low autonomy, high structure) toward students with lower academic achievement levels and/or those of whom teachers have lower expectations. This is concerning as such a teaching style can further undermine motivation, engagement, and achievement of students who are already academically at risk.

Peer Influence on (Dis)Engagement: The Role of Academic Reputation, Friendship and Social Status
Presenting Author: Karine Verschueren, KU Leuven, Belgium; **Co-Author:**Nina Steenberghs, KU Leuven, Belgium; **Co-Author:**Jeroen Lavrijsen, KU Leuven, Belgium; **Co-Author:**Noona Kiuru, University of Jyväskylä, Finland

Whereas the role of friends and popular peers for engagement has been examined previously, this study extends this research by investigating also the extent to which classmates high in academic reputation (i.e., perceived as intelligent) influence adolescents' own behavioral and emotional engagement and disengagement, using longitudinal social network analysis. A total of 3,409 Flemish 8th grade students in 158 classes in 27 schools participated in the study (M_{age} = 13.48; 49.91% boys). Students nominated classmates whom they considered as friends, as popular, and as intelligent, and reported on their own behavioral and emotional (dis)engagement in the fall and the spring of the school year. Longitudinal social network analysis revealed that, controlling for selection effects and structural network features, students high in academic reputation and popular students influenced emotional engagement and disengagement. Friends influenced both emotional and behavioral engagement and disengagement. These findings do not only demonstrate the importance of a multidimensional approach to engagement, but also encourage researchers to take a broad view of the social context of early adolescents, taking into account not only peers' social, but also their academic status.

Relations Between Teacher Emotions and Expectations
Presenting Author: Christine M Davies, University of Auckland, New Zealand; **Co-Author:**Mengnan Li, Univeristy of Auckland, China

This study aimed to examine the relations between teacher emotions and teacher expectations, both of which, in separate studies, have been shown to be significant in influencing teaching practices and students' outcomes. The participants were 135 Chinese homeroom teachers from 14 high schools. Structural equation modelling showed that 1) high teacher expectations positively predicted pleasant emotions of joy, pride, and love, and 2) negatively predicted negative emotions of anger, fatigue, hopelessness, and anxiety. The results suggested that teachers appeared to improve their emotional experiences when their expectations for their students were high. The study contributes to the scarce base of knowledge on the interplay of these two factors in the teaching profession. Additionally, the findings from this study have practical implications by indicating that teacher emotions might be improved through an intervention related to their beliefs.

Session P 5

25 August 2023 18:45 - 20:15
AUTH_DC2
Symposium

Evidence-based development of school & teaching: fostering informed decision-making through data use

Keywords: Achievement, Assessment Methods, At-risk Students, Classroom Assessment, Feedback, Mixed-method Research, Quantitative Methods, School Effectiveness, Teacher Effectiveness, Teacher Efficacy
Interest group:
Chairperson: Luisa Grützmacher, University of Vienna, Austria
Organiser: Luisa Grützmacher, University of Vienna, Austria
Organiser: Alexander Naumann, Friedrich-Schiller-University Jena, Germany
Discussant: Charalambos Charalambous, University of Cyprus, Cyprus

In a constantly evolving world, schools need to adapt to a changing external environment. Schools can adapt through intentional improvement processes that are carried out by members of the individual schools at the school or classroom level. Fundamentally, these development processes at the school or classroom level should be evidence-based, as researchers regularly point out that that data use will foster informed decision making about how to allocate resources, thereby also improving teaching and learning in a cost-effective manner.
The overall goal of this symposium is to gain a deeper insight into the manifold use of data in the context of improving schools, teaching and learning. In order to gain a full picture, different approaches will be addressed in the presentations. Presentations range from more theoretical approaches to more methodological approaches to the use of data in real life school settings. In addition, the multi-level structure within the educational system will be considered to illustrate the diversity of data use. Accordingly, the presentations address the use of data at school, classroom and student levels. The presentations are then discussed by an expert in the field of educational effectiveness research. In summary, we are confident that our symposium will contribute to a better understanding of data use at different levels of the education system.

A Bayesian multivariate multilevel modelling approach for analyzing classroom heterogeneity
Presenting Author: Alexander Naumann, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Dimitra Kolovou, St. Gallen University of Teacher Education (PHSG), Switzerland; **Co-Author:**Jan Hochweber, St. Gallen University of Teacher Education, Switzerland; **Co-Author:**Anna-Katharina Praetorius, University of Zurich, Switzerland

Educational effectiveness research regularly addresses questions related to classroom heterogeneity, for example, teachers' judgement accuracy. Teachers' judgement accuracy refers to the ability of teachers to make accurate judgements of their students' achievement and is considered a necessary condition for meaningful teaching activities, especially in terms of optimal tailoring teaching practice to students' strengths and needs (e.g., Pielmeier, Huber, & Seidel, 2018). However, commonly applied measures of teachers' judgement accuracy have significant limitations as they (a) are prone to sampling and measurement error and (b) do not adequately deal with imbalanced and hierarchical data structures. Thus, the aim of our study is providing a Bayesian multivariate multilevel model tailored to overcome these modelling issues and allowing for the investigation of teachers' judgement accuracy in multiple content domains simultaneously. For illustration purposes, we applied our model to empirical data from 54 teachers and their students in three math content domains. The model worked well in the application. Our approach allows for model-based estimation of teachers' judgement accuracy, including appropriate handling of hierarchical and imbalanced data structures, and the specification of latent variables to deal with measurement error comparable to "doubly latent" analyses of contextual effects (Lüdtke, Marsh, Robitzsch, & Trautwein, 2011).

Orientation of development perspectives in the school improvement process
Presenting Author: Luisa Grützmacher, University of Vienna, Austria; **Co-Author:**Julia Holzer, University of Vienna, Austria; **Co-Author:**Marko Lüftenegger, University of Vienna, Austria; **Co-Author:**Barbara Schober, University of Vienna, Austria; **Co-Author:**Manfred Prenzel, University of Vienna, Austria

Schools in socially deprived areas face particularly challenging circumstances and therefore tend to have greater development needs. Difficulties, success and experienced challenges can be a drive force for learning. The overall goal of this study is to gain a deeper understanding about the situation of schools in socially deprived areas and the decisions regarding the orientation of those schools in the school improvement process. Thus, strengths, difficulties, challenges and developmental perspectives of schools in socially deprived areas are examined. Matches of developmental perspectives with reported strengths, difficulties, or challenges indicate whether schools are trying to build existing strengths, reduce difficulties, or overcome challenges. No matches of developmental perspectives indicate that schools are oriented toward unidentified factors. The study comprises data from 100 Austrian schools in socially deprived areas. A mixed-methods approach was applied. Qualitative data of school principals were analyzed using qualitative content analysis and showed a diversity of challenges, difficulties, strengths and development perspectives. While some aspects were mentioned only rarely, there was a high level of agreement on other aspects. The qualitative data were processed for further quantitative analysis. Results of the latent profile analysis performed in Mplus indicate that there are different underlying profiles in the orientation of development perspectives toward strengths, difficulties, challenges and/or unidentified factors.

On the Importance and Necessity of Multiple Informant Studies for Evidence-based School Development
Presenting Author: Christoph Helm, Johannes Kepler University Linz, Austria; **Co-Author:**Stephan Gerhard Huber, PH Zug, Switzerland

Evidence-based school development processes heavily rely on valid data. However, the validity of survey data strongly depends on how is asked (e.g., school leaders or teachers). Therefore, we present two studies that question, whether and to what extant multiple informants, i.e., school principals, teachers, students, and parents agree when rating school quality (study 1) and quality of distance learning (study 2). In study 1, using hierarchical data of 2380 German teachers nested within 116 principals we perform cross-level group measurement invariance models to estimate the latent mean differences and the latent correlations (at school-level) between principal and teacher ratings. Results of study 1 show that principals rate the quality of their schools exceedingly stronger than their teachers. Although findings in study 2 yield a quite similar pattern across the three respondent groups, some associations (i.e., parental support and student outcomes) largely differ between the groups. In total, our results indicate that multiple informant studies are needed to obtain valid data for decision making during school development processes. We discuss your findings against the limitation of the design of your studies and draw implications and consequences for evidence-based school development processes.

Computer-based formative assessment and its potential for classroom and school development
Presenting Author: Julia Käfer, Institute for Educational Analysis (IBBW), Germany; **Co-Author:**Evelin Ruth-Herbein, Institute for Educational Analysis (IBBW), Germany, Germany; **Co-Author:**Eva-Maria Böker, Institute for Educational Analysis (IBBW), Germany, Germany; **Co-Author:**Benjamin Fauth, Institute for Educational Analysis (IBBW), Germany, Germany

Empirical studies have shown that formative assessment is a promising way to improve teaching and learning (e.g., Black & Wiliam, 2009). The central idea of formative assessment is to make use of assessment information about students' understanding in order to adapt instructions according to students' needs as well as to provide students with individual feedback (e.g., Corno, 2008). In order to do so, teachers need to assess the development of students' understanding continuously (Schütze, Souvignier & Hasselhorn, 2018). Computer-based solutions may help teachers to implement the concept of formative assessment in an economic way.In the symposium, we present the project "Computer-based Formative Assessment in Elementary School" (Co-FormAt) that started in summer 2021. The aim of the Co-FormAt project is to develop an online tool for formative assessment that can be easily implemented in everyday classroom practices, fits the pedagogical as well as subject-specific didactical principles of the targeted subject, and is evaluated regarding its effectiveness for teaching and learning. Development and evaluation of the Co-FormAt-online tool follow a step-by-step approach in cooperation with researchers as well as practitioners. For the symposium, results of two pilot studies will provide information a) on the quality of the diagnostic instruments and b) on the online tool's implementation in everyday classroom practices. We are convinced that by supporting teachers to understand the potential of formative assessment and by providing a tool that helps teachers to implement this concept in their teaching routines, we can foster teaching and learning processes at different levels.

Session P 6

25 August 2023 18:45 - 20:15
AUTH_DC1
Symposium
Learning and Social Interaction

Transactivity and shared regulation in collaborative problem solving: Concepts, scaffolds, analyses

Keywords: Argumentation, Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Game-based Learning, Knowledge Construction, Learning Analytics, Peer Interaction, Problem Solving, Problem-based Learning, Social Interaction
Interest group: SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Freydis Vogel, Universität Hamburg, Germany
Organiser: Freydis Vogel, Universität Hamburg, Germany
Organiser: Armin Weinberger, Saarland University, Germany
Organiser: Miguel Angel Rejon Zamudio, Saarland University, Germany
Organiser: Jun Oshima, Shizuoka University, Japan
Organiser: Cindy Hmelo-Silver, Indiana University, United States
Organiser: Chen Feng, Indiana University, United States
Discussant: Ingo Kollar, University of Augsburg, Germany

Collaborative problem solving is commonly used to engage learners in joint discourse and knowledge co-construction. The related collaborative learning processes have the possibility for both misunderstandings and mutual support towards deeper understanding. Important qualities for such learning processes to be successful are transactively reasoning together and co-regulating each other to advance towards solutions. To clarify the role of these qualities of collaborative learning processes, this symposium will bring together perspectives on conceptualizing, facilitating and analyzing mechanisms of collaborative learning, namely shared regulation and transactivity. The papers will particularly focus on the learning discourse in different collaborative problem-solving settings. Jun Oshima et al. will introduce how temporal network analysis can be used to analyse learning regulation and transactivity as emerging mechanisms in collaborative learning discourse on solving a Jasper Woodbury problem. The paper by Chen Feng et al. reveals facilitation strategies used in collaborative discourse in game-based complex problem-solving environments focusing on supporting socially shared regulation. Miguel Rejon et al. will present findings from a study on how transactive sentence openers can facilitate social modes of co-construction during collaborative problem-solving discourse and eventually affect learning. Finally, Vogel and Weinberger present refinements of the conceptualization of transactivity as a relevant mechanism for collaborative discourse targeting problem solving and learning. The significance and relation of the collected papers for our understanding of the relevant processes and mechanisms in collaborative problem solving will be discussed.

Regulating transactive learning discourse: A new analytics framework using temporal network analysis
Presenting Author: Jun Oshima, Shizuoka University, Japan; **Co-Author:**Ritsuko Oshima, Shizuoka University, Japan; **Co-Author:**Shotaro Yamashita, Shizuoka University, Japan; **Co-Author:**Jun Lu, Shizuoka University, Japan

In small groups, learners have to regulate their epistemic engagements in improving their ideas through transactive discourse. In this study, we introduce a new analytics framework to examine learners' engagement in their transactive discourse using temporal network analysis. First, transcriptions of their collaborative discourse are transformed into a bipartite graph of discourse exchanges and vocabulary for representing their ideas. Then a vocabulary network is created based on the co-occurrence of words in each exchange. Finally, temporal change in the vocabulary network is visualized, and metrics are calculated to identify how each learner contribute to their collaborative discourse by displacing her discourse from the dataset. In this study, we demonstrate how the application software of the temporal network analysis, Knowledge-Building Discourse Explorer (KBDeX), works for analyzing the transactivity in collaborative discourse. We use discourse data where groups of three university students collaboratively solved a Jasper Woodbury problem. Several patterns of the transactive discourse were identified and discussed from the perspective of the idea improvement. We did not find many groups where all three students engaged in transactivity all the time. Instead, they intentionally or unintentionally rotated their leadership in the transactivity in various ways. Through in-depth discourse analysis, we discuss how they rotated their leadership in the transactivity.

Exploring Facilitation Strategies for Socially Shared Regulation in Game-based Problem-Solving
Presenting Author: Chen Feng, Indiana University, United States; **Co-Author:**Haesol Bae, Indiana University Bloomington, United States; **Co-Author:**Tianshu (Haley) Wang, Indiana University Bloomington, United States; **Co-Author:**Daeun Hong, Indiana University Bloomington, United States; **Co-Author:**Krista D. Glazewski, Indiana University Bloomington, United States; **Co-Author:**Cindy Hmelo-Silver, Indiana University Bloomington, United States; **Co-Author:**Thomas Brush, Indiana University Bloomington, United States; **Co-Author:**Seung Lee, North Carolina State University, United States; **Co-Author:**Bradford W. Mott, North Carolina State University, United States; **Co-Author:**James C. Lester, North Carolina State University, United States

Problem-based learning is an ideal context for understanding how learners engage in socially-shared regulation within complex problem-solving environments. Successful problem-based learning (PBL) often requires students to collectively regulate their learning processes as a group, or engage in socially shared regulation of learning (SSRL). This paper focuses on how facilitators supported SSRL in the context of middle-school game-based PBL. During the gameplay three to four students in a group explored a fictional island to solve the problem and negotiate their ideas in text-based, in-game chat. The facilitators closely monitored the group chat and provided contingent support. This study analyzed chat messages during gameplay by conversation analysis to reveal the facilitation strategies that supported SSRL. They used direct modeling strategies, which included establishing regulatory processes, promoting group awareness and dealing with contingency. They also used indirect strategies, such as prompting questions and acknowledgment of regulation. We further investigated the facilitation patterns associated with fading the support and transferring responsibility to students for regulating their own learning. The findings will inform researchers and practitioners about designs for prompts and development of technological tools such as adaptive scaffolding to support SSRL in PBL or other forms of game-based complex problem-solving environment.

Effects of Transactive Sentence Starters on Knowledge Co-Construction Processes and Outcomes
Presenting Author: Freydis Vogel, Universität Hamburg, Germany; **Co-Author:**Miguel Angel Rejon Zamudio, Saarland University, Germany; **Co-Author:**Armin Weinberger, Saarland University, Germany

Engaging in specific social modes of co-construction, such as consensus building, is important for successful collaborative learning. As a basic quality of collaborative learning, transactivity has been defined as operating on the reasoning of a learning partner. This implies that during the learning process learners

need to alternately contribute novel ideas and refer to each other based on shared contributions. The present 2×2-study (N = 154) explores the effects of scaffolding reference and novelty by means of respective sentence starters during a synchronous text-based collaborative task about attribution theory. While all learners improved their descriptive domain-knowledge, learners provided with novelty scaffolds outperformed learners without novelty scaffolds regarding the acquisition of domain knowledge. The analysis of the collaboration process does not suggest that novelty scaffolds positively affect engaging in various social modes of co-construction and thus, cannot explain the positive effects on individual learning outcomes. In contrast, scaffolding for reference reduces externalization and quick consensus building but increases integration-oriented and conflict-oriented consensus-building. This would be a pattern in the learning processes that is assumed to be positively related to learning outcomes, yet the study did not show reference scaffolds affecting descriptive domain knowledge learning. While the study shows that it is worthwhile to integrate both novelty and reference as factors of transactivity, future research needs to identify the learning processes mediating the effects of novelty scaffolds and the learning outcomes that align with the effects of reference scaffolds on the social modes in the collaborative learning process.

Transactivity in collaborative learning processes: The complementary roles of novelty and reference
Presenting Author: Freydis Vogel, Universität Hamburg, Germany; **Co-Author:**Armin Weinberger, Saarland University, Germany

Transactivity is considered an important quality of effective collaborative learning, defined as “reasoning operating on the reasoning of the other” (Berkowitz & Gibbs, 1983, p. 402). Previous approaches focus on learners building upon each other’s contributions to conceptualize transactivity. Here, activities such as paraphrasing or criticizing learners’ interactions are specified as being transactive and beneficial for learning. However, effects of such transactive moves on individual learning are commonly related to their specific features facilitating cognitive elaboration which in turn is not a defining feature for transactivity. Building upon other contributions may not be sufficient to fully define transactivity as it disregards the idea that for knowledge building new aspects need to be integrated into the collaborative exchange. With this paper, we explore how the conceptualization of transactivity can be refined as a mechanism of collaborative learning processes distinct from their individual cognitive qualities. We introduce the complementary roles of novelty and reference to describe transactive learning processes. Furthermore, we suggest the ideal ratio of novelty and reference in contributions to vary throughout the collaborative learning process. For instance, ideal transactivity in the beginning of a learning dialogue may contain novelty to a higher degree while during the critical reflection of arguments a higher ratio of reference may be needed. The refined conceptualization of transactivity has implications for research and practice (e.g., how scaffolding needs to be adjusted to dynamics of ratio for novelty and reference at different times). Further hypotheses included in the refined conceptualization of transactivity will be discussed.

Session P 7

25 August 2023 18:45 - 20:15
UOM_CR
Symposium

Towards a better understanding of EF and its closely related constructs in school-age children

Keywords: Cognitive Development, Cognitive Skills and Processes, Developmental Processes, Mathematics/Numeracy, Self-regulated Learning and Behaviour
Interest group:
Chairperson: Claudia Roebers, University of Bern, Switzerland
Organiser: Claudia Roebers, University of Bern, Switzerland
Organiser: Ebru Ger, University of Bern, Switzerland
Discussant: Evelyn Kroesbergen, Radboud University, Netherlands

Executive functions (EF) are closely related to numerous distinct cognitive skills such as working memory (WM), intelligence, and academic skills (Blair, 2006; Blair & Razza, 2007; Spiegel et al., 2021). Understanding these links' nature and underlying mechanisms is fundamental to understanding their development and developing targeted interventions and curricula in educational settings. In this symposium, we focus on these links in an age window spanning kindergarten to adolescence and will present contemporary and cutting-edge research on the processes driving the link between EF, WM, and academic skills. Our results suggest that inhibition and WM differentially relate to distinct math skills. Although the traditional measure of accuracy and no measure of shifting was found related to fluid intelligence and verbal WM, the opposite pattern was found for math skills. Namely, post-error slowing as a possible indicator of monitoring within EF tasks was more strongly related than the traditional measures of inhibition and shifting. In the planned symposium, we will discuss the possibility that fine-grained measures of cognitive control and shifting may be important for academic skills; “pure” inhibition may instead be more critical for fluid intelligence. Furthermore, our results will open new avenues for research as they underline the importance of employing a multitude of measures in EF and taking into account potential moderating factors such as intelligence and academic skills.

Post-error slowing across inhibition and switching tasks: An explorative study
Presenting Author: Kerry Lee, The Education University of Hong Kong, Hong Kong; **Co-Author:**Xiaozi Gao, The Education University of Hong Kong, Hong Kong

Post-error slowing (PES) refers to the phenomenon that people slow down in their responses after committing an error. It was widely observed in cognitive tasks with demands on inhibition control with a conflict component, such as the Stroop, Simon, and Flanker tasks (Dubravac et al., 2022; Ger & Roebers, 2023). However, few studies have examined whether the phenomenon is observed in executive control tasks that have lower inhibitory demands (e.g., switching tasks). Furthermore, although PES has been used as an indicator of cognitive control (Roebers, 2017), it is not clear whether PES explains academic performance better than traditional indicators of cognitive control. This study tested whether PES could be observed in both inhibition and switching tasks and examined whether PES was more strongly associated with behavioural inhibition and early numeracy performance than traditional inhibitory measures. Children (N = 339, M_{age} = 57.37) from Hong Kong was administered the Simon (a measure of inhibition), Picture-Symbol (switching), Head-Toes-Knees-Shoulders (behavioural inhibition), and a battery of numeracy tasks. PES was related positively to task accuracy in both the Simon and Picture-Symbol tasks. Children with either high or low accuracy engaged in PES in the Simon task. Only children with high-accuracy exhibited PES in the Picture-Symbol task. PES was more strongly related to behavioural inhibition and numeracy performance than traditional measures of inhibitory or switch costs. These findings suggest that PES is related to children’s abilities to perform switch tasks accurately and may be a more sensitive measure of cognitive control than cost-based subtraction measures.

Do Science and Non-science Students Similarly Use Executive Function Skills in Maths and Physics?
Presenting Author: Konstantinos G Tsigaridis, University of Cambridge, Greece; **Co-Author:**Rui Wang, University of Cambridge, United Kingdom; **Co-Author:**Jiayin Zheng, University of Cambridge, UK, United Kingdom; **Co-Author:**Michelle Ellefson, University of Cambridge, United Kingdom

Executive function skills seem to play a role in a variety of school learning settings. Recent findings suggest that executive function skills could impact science learning. However, it is unclear how this impact applies to different science domains. One science domain where a better understanding of how executive function skills impact learning is physics. We focused on physics because teachers and policymakers often express concerns about secondary school students’ physics attainment, especially in the areas of problem solving and understanding physics concepts. Mathematical skills seem to underpin physics learning. Additionally, there are links between mathematical and executive function skills. As such, we included measures of mathematical skills to better understand whether they mediate any links between executive function skills and physics problem solving or understanding physics concepts. We recruited 15- to 17-year-old students from Greece (N = 403, M_{age} = 15.78 years, SD_{age} = 0.74 years) to complete a variety of tasks covering core aspects of these skills. For science students, executive function skills predicted mathematical skills, which in turn predicted physics problem solving and concepts. Executive function skills did not directly predict either of the physics skills but did so indirectly through mathematical skills. In contrast, for non-science students, executive function skills did not have direct or indirect links to any of the mathematical or physics skills, but there were links between mathematical skills and both of the physics skills. These findings help enhance our understanding of the core cognitive skills that might underpin physics learning.

The role of Executive Function in math and literacy domains in young children
Presenting Author: Laura Traverso, Department of Education Sciences, University of Genoa, Italy; **Co-Author:**Paola Viterbori, Department of Education

Sciences, University of Genoa, Italy; **Co-Author:**Elena Gandolfi, University of Turin, Italy; **Co-Author:**Irene Tonizzi, Department of Education Sciences, University of Genoa, Italy; **Co-Author:**Maria Carmen Usai, Department of Education Sciences, University of Genoa, Italy

In the last decades several studies showed that there is a strong relationship between performance in EF tasks and academic achievement. Despite this, the mechanisms by which EF skills support literacy and math development are not fully understood. To advance in this research field, significant attention should be paid to better understanding which EF component is associated with which aspect of learning at a particular age. Given that both EF and literacy and math domains are complex constructs (and even debate constructs) that change over time, “fine-grained” examinations may be useful. In this talk, two studies that investigate the role of EF in both literacy and math domains (pre academic skills) will be presented and the role of specific EF in accounting for specific aspects of learning will be discussed. Advancing in this research field is essential to successfully inform and influence classroom practice.

The relationship between executive functions, working memory, and intelligence in children
Presenting Author: Ebru Ger, University of Bern, Switzerland; **Co-Author:**Claudia Roebers, University of Bern, Switzerland

Executive functions (EF), working memory (WM), and intelligence are closely associated but distinct constructs (Blair, 2006). What underlies the associations between these constructs, especially in childhood, is less well understood. In this pre-registered study, along with traditional average accuracy and RT-based measures of EF, we investigated post-error slowing (PES) in EF, as a manifestation of cognitive control, in relation to WM and intelligence. Thereby we aimed to elucidate whether cognitive control may be one underlying component to explain the associations between these constructs. We tested kindergarten children (Mage=6.4 years, SDage=0.3) in an EF, verbal WM, visuospatial WM, and a fluid (non-verbal) intelligence task. We found significant and positive associations between accuracy in the incongruent block of the EF task (mainly assessing inhibition component) with fluid intelligence (r=.19, p=.024) and verbal WM (r=.18, p=.028), but not visuospatial WM (r=.07, p=.375). No significant associations emerged between congruency effect, shift cost, or PES in EF and intelligence or WM. Verbal WM and visuospatial WM were positively correlated (r=.20, p=.015), while intelligence was positively correlated only with verbal WM (r=.16, p=.049). Exploratory analyses revealed a significant negative correlation between mean RT in the incongruent block of the EF task and visuospatial WM, even after controlling for accuracy (r=-.28, p

Session P 8

25 August 2023 18:45 - 20:15
AUTH_T002
Symposium

Necessary Skills to deal with uncertainties: Insights from teachers and students

Keywords: Attitudes and Beliefs, Higher Education, In-service Teachers, Knowledge Construction, Learning Approaches, Mathematics/Numeracy, Pre-service Teachers, Primary Education, Quantitative Methods, Reasoning, Science Education, Secondary Education, Teaching/Instructional Strategies
Interest group:
Chairperson: Meg Farrell, Technische Universität München, Germany
Organiser: Despoina Georgiou, Utrecht University, Netherlands
Discussant: Olga Ioannidou, University College Dublin, Ireland

Education is faced with a rapidly changing and uncertain world, requiring teachers and students to move beyond formulaic knowledge and skills. To bring certainty to the uncertainty in education, teachers and students are expected to be equipped with the necessary skills and knowledge to make evidence-informed decisions. This symposium maps the literacy and reasoning skills to deal with challenges and uncertainties in education focusing on insights from both students and teachers. The first contribution introduces a framework to support pre-service teachers’ efforts to learn how to evaluate and deal with evidence in uncertain times, such as the COVID-19 pandemic. The second contribution explores primary school teachers’ attitudes toward research, their information literacy skills, and the frequency of evidence used during the times of the pandemic. Contribution three implements’ a scenario-based teaching approach to promote secondary school students’ agency and scientific literacy skills when dealing with global challenges, such as climate change. Finally, contribution four focuses on the development of primary school students’ conditional reasoning skills in everyday and mathematical contexts toward a better understanding of uncertainty. Overall, this symposium highlights the role of formal and informal education in equipping students and teachers with the necessary skills to deal with uncertainties in everyday life. The overarching aim of these contributions is to provide recommendations for the inclusion of such skills in national curricula, as well as teacher education programs. The session will close with a discussion by Gabriela Martinez Sainz whose work focuses on how to foster 21st-century skills in education.

Learning about the Nature of Knowledge – Lessons in Teacher Education
Presenting Author: Olga Ioannidou, University College Dublin, Ireland; **Co-Author:**Alison Cullinane, University of Edinburgh, United Kingdom

The way in which knowledge is produced in science entails a high degree of uncertainty and tentativeness, however, explicit reference of these aspects is rarely communicated in the classroom, science textbooks and curricula. School textbooks often present factual concepts with limited understanding of how science content knowledge has come to exist. This study investigates the impact of a teaching unit introducing the concept of the Nature of Knowledge (NOK) with preservice secondary teachers. It aimed to investigate their understanding of information about Covid from the media and subsequently investigate the value they saw for incorporating NOK in school science. The study took place as part of a teacher training programme in England. Results revealed that preservice teachers’ (n=37) understanding of theories, laws and models were improved. In-depth qualitative analysis reveals patterns in participants definitions, as well as the shift in their conceptualisations after the teaching session. This study highlights the impact of a short session on preservice teachers’ conceptual understanding and perceptions regarding NOK once highlighted to them.

Dealing with Uncertainties in Teaching: Primary School Teachers’ Skills, Attitudes, and Evidence Use
Presenting Author: Despoina Georgiou, Utrecht University, Netherlands; **Co-Author:**Maria Rodriguez Alcolea, Utrecht University, Netherlands

Primary school teachers often deal with complex situations which lead to uncertainty about how to act when teaching. The use of research evidence to inform teaching practice may support teachers’ efforts to deal with uncertainties when preparing to teach. There have been several initiatives all around Europe aimed at supporting teachers to easily access and critically reflect upon research evidence. However, little is known about teachers’ engagement in evidence-informed teaching practices. This study explores the relationships between primary school teachers’ information literacy skills, attitudes toward research, and their self-reported frequency of use of scientific evidence in teaching practice. We employed a quantitative design and collected data from $N = 120$ primary school teachers. Results indicate a significant positive relationship between attitudes and information literacy skills and a significant negative relationship between information literacy skills and teachers’ self-reported use of evidence. Most primary school teachers possess relatively positive attitudes (65%) toward research; however, they almost never (87%) use scientific evidence to inform their teaching practice. Accordingly, they show low to medium information literacy skills (95%). These findings suggest that positive attitudes towards evidence-informed practice do not necessarily lead to using evidence in teaching practice. Low information literacy skills and in particular low skills when assessing the quality of research evidence may be a factor limiting teachers’ use of research evidence. Professional development courses targeting teachers’ information literacy skills to establish an information culture within schools may support the use of evidence in teaching practice.

Student Agency and Future Literacy Skills: A Case Study of Scenario-Based Teaching
Presenting Author: Olga Ioannidou, University College Dublin, Ireland; **Co-Author:**Liam Guilfoyle, University of Oxford, United Kingdom; **Co-Author:**Sibel Erduran, University of Oxford, United Kingdom

The 21st century has been characterised by fast-paced global societal, scientific, and technological challenges. As such, future citizens should be adequately equipped with necessary skills to navigate the high degree of uncertainty that they entail. Utilising the affordances of learning in informal spaces, this study explores the use of a scenario-based teaching approach to facilitate students’ agency and global competencies towards climate change. For this purpose, a

teaching session focusing on possible positive, as well as troubled climate change scenarios, was designed and delivered in a Museum of Natural History in England. Twenty-four (n=24) secondary school students (Year 12) took part in the study. Students responded to a paper-pencil questionnaire before and after the teaching session and paired-sample t-tests were performed to examine potential gains in their feeling of agency, futures literacy and epistemic emotions. Results indicated a statistically significant positive effect on students' climate agency [$t(22) = 2.1$, p

Conditional Reasoning: Supporting Elementary Students' Skills in Mathematical and Everyday Contexts
Presenting Author: Anastasia Datsogianni, University of Cyprus, Cyprus; **Co-Author:**Stefan Ufer, Ludwig-Maximilians-Universität (LMU), Germany

Conditional reasoning (i.e. reasoning about "if...then" statements) is founded on the understanding of uncertainty. Not only in everyday life but also in mathematics, students need to derive logical inferences from given premises by generating mental alternative models. Elementary students' conditional reasoning skills within mathematics have been rarely investigated (Datsogianni, Sodian, Markovits, & Ufer, 2020). Even though this reasoning type is well-researched in developmental psychology (e.g Barroulliet & Lecas, 2002), the evidence about instructional methods that might support students to cope with conditionals more efficiently, is still poor. Hence, this study aimed to explore the effects of two short-term trainings based on alternatives generation training on students' conditional reasoning scores within mathematics and everyday context. The study was carried out in a 60 minute small group school activity consisted of the pre-testing, intervention, and post-testing. GLMM analysis was conducted about students 'conditional reasoning scores in each context (mathematical/ everyday) by time (pre and post), specific condition (experimental/ control) and logical form (MP, MT, AC, DA). Data from 285 elementary students from Cyprus (5th grade $N = 144$, and 6th grade $N = 141$) showed mixed results, revealing an increase of AC and decrease of DA reasoning score after the training in the mathematical context and the exact opposite results for the everyday one. Even if none of the trainings seemed to totally function as scaffold of students' conditional reasoning skills in each context and logical form, this study adds some necessary evidence in this research area.

Session P 9

25 August 2023 18:45 - 20:15
UOM_A03
Symposium
Cognitive Science, Lifelong Learning

Self-regulation in young learners

Keywords: Cognitive Development, Cognitive Skills and Processes, Early Childhood Education, Learning Strategies, Lifelong Learning, Metacognition, Self-efficacy, Self-regulated Learning and Behaviour
Interest group: SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Charlotte Dignath, TU Dortmund University, Germany
Chairperson: Bernadette van Berk, Technical University of Dortmund, Germany
Discussant: Nancy Perry, University of British Columbia, Canada

Self-regulation (SR) has been shown to be a key competence for children to be successful learners throughout their academic career (Dent & Koenka, 2016). Recent research indicated that even young children can learn to self-regulate their thoughts and actions, but open questions remain with regard to factors associated with developing SR and the role that SR has for academic performance across time (Perry, 2019). More research is required across the kindergarten and primary school years to investigate the developmental trajectory of SR processes to understand how best to foster SR even before children enter school and during their first years of schooling. This symposium seeks to fill this gap by providing research evidence on (1) how the environment of early childhood classrooms invite young children to engage in SR, (2) the role of early SR at kindergarten age for later learning outcomes at school, (3) factors to explain variation in SR in young primary school children, and (4) how motivational and metacognitive aspects of SR can predict academic performance in older primary school students. The results will provide new insights into SR development at key transitions from early childhood education to primary school, which can be used to derive implications for interventions.
Dent, A. L., & Koenka, A. C. (2016). The relation between self-regulated learning and academic achievement across childhood and adolescence: A meta-analysis. *Educational Psychology Review*, *28*(3), 425-474.
Perry, N. E. (2019). Recognizing early childhood as a critical time for developing and supporting self-regulation.*Metacognition and Learning*, *14*(3), 327-334.

How do self-efficacy and procedural metacognition predict performance?
Presenting Author: Mariette van Loon, University of Zurich, Switzerland; **Co-Author:**Claudia Roebers, University of Bern, Switzerland

Metacognitive monitoring accuracy and self-efficacy are presumed to affect learning performance. It is yet unknown to what extent children's metacognitive monitoring judgments and self-efficacy judgments about their ability to successfully complete a specific task are related. The first aim of the present study was to investigate how monitoring judgments and self-efficacy judgments are related. The second aim was to investigate to what extent self-efficacy and monitoring accuracy affect regulation and performance. These questions were addressed for a group of 10-year-olds and a group of 12-year-olds, who worked on a self-regulated concept learning task. For both age groups, self-efficacy judgments were moderately and significantly correlated with monitoring judgments. For fourth graders, regulation (effective restudy) had an effect on performance, however, there were no direct effects of monitoring accuracy and self-efficacy. For sixth graders, however, there were significant effects of self-efficacy and monitoring accuracy on task performance. These findings may indicate that monitoring accuracy and self-efficacy start to affect children's learning between the age of 10 and 12 years old. Moreover, results imply that, when supporting children in middle childhood with learning, teachers may mainly focus on effective regulation of learning. When supporting children in late childhood, in addition to supporting them with regulation, supporting with metacognitive monitoring accuracy and self-efficacy may have beneficial effects on their learning outcomes.

What makes primary school students use SRL strategies? Expectancy and value to explain SRL
Presenting Author: Bernadette van Berk, Technical University of Dortmund, Germany; **Co-Author:**Charlotte Dignath, TU Dortmund University, Germany

Self-regulation of learning (SRL) is considered a strong predictor for future academic success (Dent & Koenka, 2016; Robson et al., 2020) and an important basis for lifelong learning (Weinstein et al., 2011). Studies have shown that already young children from 2-3 years onwards use self-regulation strategies (Perry, 2019). But there is a lot of variation: while some students adapt to challenges in learning processes strategically, others give up and fall behind. To date we have little understanding on what explains this variation between students in self-regulated learning. We apply an skill-and-will-based expectancy-value approach to SRL to investigate how young students' strategy knowledge, and their self-efficacy and utility beliefs regarding SRL explain students' use of SRL strategies in primary school homework situations.Fifty students and their parents have participated in an online study (data collection still ongoing), using a multi-method approach to assess students' use of SRL strategies. Preliminary analyses suggest that expectancy and value beliefs are significant predictors for students' self-reported use of SRL strategies, while strategy knowledge explained parents' ratings of their children's SRL strategy use. The findings will be replicated using the interview and thinking-aloud data of students' SRL strategy use gathered in the data collection, and the analyses will be updated once the data collection has ended. Results will be available by the time of the conference.

Longitudinal predictors of academic outcomes in the first year of school
Presenting Author: Elena Vasseleu, University of Wollongong, Australia; **Co-Author:**Steven Howard, University of Wollongong, Australia

An extensive research base supports foundational abilities – including academic concept knowledge (e.g., basic literacy and numeracy ability) and self-regulation – as important, longitudinal predictors of academic outcomes across formal schooling. Whereas theoretical reasoning around the role of earlier academic knowledge infers a more direct link (i.e., knowledge as cumulative), self-regulation is seen as more of an indirect supporter of knowledge acquisition (i.e., supporting effective and sustained engagement with learning). Few studies to date, however, have sought to examine how these two abilities (when measured in the preschool years) may interact to longitudinally predict academic achievement. The current study sought to examine main and possible

interaction effects between prior-to-school self-regulation and academic knowledge on Kindergarten academic outcomes (i.e., numeracy and vocabulary ability), 18 months later. Longitudinal findings from 199 children (mean age at preschool = 4.49 years), supported preschool self-regulation and academic concept knowledge as significant independent predictors of academic knowledge at the end of the first year of school. Results also suggested a significant interaction between self-regulation and academic knowledge, such that higher levels of self-regulation showed greater strength of association with academic outcomes when children had initially lower academic knowledge. Current findings provide empirical support for the important independent and protective role of early self-regulation for later learning outcomes and reinforce self-regulation as an important and viable target for early intervention.

Examining environmental affordances for Self-Regulation in Australian Early Childhood settings
Presenting Author: Deborah Pino-Pasternak, University of Canberra, Australia

It is well established that young children's capacity to self-regulate develops significantly during the early years and predicts subsequent academic and social outcomes. Despite widespread evidence of the benefits of self-regulation (SR) interventions as add-ons to curriculum, there is a dearth of research examining how teachers in Early Childhood (EC) environments promote SR in daily routines, beyond measures of classroom quality. This qualitative study used Affordance Theory, examining how the physical and the social environment of EC classrooms invite young children to engage in SR. Five preschool and four kindergarten classrooms in one Australian Early Childhood School were observed over three hours at different times of the day. Data was gathered using naturalistic observations and running records of physical and social affordances for SR. Physical affordances were operationalized as access to spaces, belongings, food/drinks, and materials; and nature of tasks or activities. Social affordances were defined as social practices such as routines, affective interactions, and dialogic practices (including instruction). Affordances for SR were examined alongside a continuum that ranged from adult-determined (minimal affordances for child regulation) to student-determined (maximum affordances for child regulation). Findings showed more and more varied affordances for children's self-regulation in preschool classrooms when compared to kindergarten. Across groups most environmental and social affordances involved adults supporting SR during adult-determined activities rather than actively promoting children's goal setting and decision-making. Lack of opportunities for children's agency in their learning environments was consistent across settings but considerably diminished in kindergarten classrooms.

Session P 10

25 August 2023 18:45 - 20:15
AUTH_DC3
Single Paper
Higher Education

Different Aspects of Doctoral Education

Keywords: Communication Skills, Curriculum Development, Doctoral Education, Economics of Education, Educational Policy, Higher Education, Mentoring and Coaching, Metacognition, Qualitative Methods, Science and STEM, Social Aspects of Learning and Teaching
Interest group: SIG 04 - Higher Education, SIG 14 - Learning and Professional Development, SIG 24 - Researcher Education and Careers
Chairperson: Marco Rüth, University of Cologne, Germany

PhD Students' Acceptance of Teaching Culture and by the Teaching Community: a Phenomenographic Study
Keywords: Doctoral Education, Higher Education, Qualitative Methods, Social Aspects of Learning and Teaching
Presenting Author: Triinu Soomere, University of Tartu, Estonia; **Co-Author:**Mari Karm, University of Tartu, Estonia; **Co-Author:**Torgny Roxå, Lund University, Sweden

One of the aims of PhD students' socialisation is for them to accept the norms of teaching culture, and to be fully engaged with and accepted by the university community. However, when PhD students enter universities, they do not necessarily accept all cultural norms, neither do they all experience acceptance by the teaching community. This phenomenographic study explored the experiences of twenty-five PhD students' around their acceptance of norms of teaching culture, and of their acceptance by the university teaching community. The study identified three qualitatively different ways in which PhD students experienced acceptance of teaching culture and acceptance into the teaching community: as equal partners, as knocking against boundaries and as being on the margins.

Industrial PhD students' research communication practices in academia and the industry
Keywords: Communication Skills, Doctoral Education, Metacognition, Science and STEM
Presenting Author: Maria Cervin-Ellqvist, Chalmers University of Technology, Sweden

Collaborations between academia and industry are becoming increasingly common, especially in STEM. In an industrial or hybrid academic/industrial setting, research must be communicated both to researchers and other audiences, a presumably complex communication reality that has received comparatively little attention in research. One example is industrial PhD students, who are funded by industry and thus have both academia and industry as main stakeholders for their research communication. This project examines research communication practices of researchers who transition between academia and industry, aiming to pinpoint how universities can support such transitions. This specific study explores industrial PhD students' experiences of communicating research for different audiences, and how they learn to do so. The findings show that industrial PhD students indeed do communicate to both researchers and industry, and that there are several challenges in doing so, including writing scientific articles, and adapting to varying levels of knowledge. Moreover, the strategies students use to face these challenges corroborate conclusions from previous research that genre awareness and self-regulation are important in transitions across different contexts, and in learning to communicate research to different audiences. However, few students had participated in formal training that they had found useful in communicating to industry, and many wanted more support. The insights from this study can be used to better meet industrial PhD students' needs in this regard, for example in the design of communication courses in HE, and specifically in STEM.

The Influence of Role Models on Women in Academia - an Interview Study
Keywords: Doctoral Education, Economics of Education, Mentoring and Coaching, Qualitative Methods
Presenting Author: Jule Hangen, Goethe University Frankfurt, Germany; **Co-Author:**Patricia Köpfer, University of Hohenheim, Germany

Women in tenured professorships are still a minority, the so-called "leaky pipeline" (diminishing share of women for higher positions) is particularly evident. However, women's and men's decision-making processes seem to be different: women still disproportionately leave academic careers after graduation or after a successful doctorate. We focus on the impact of role models and examine decision-determining factors at each career stage in academia to gain a deeper understanding of the aforementioned decision-making process. For this reason, an interview study was conducted (N=30). Results show that women partly lack female role models. Not all men as well as women see the need for role models. Women in particular are looking for role models who are also pioneers in reconciling family and career.

Graduate school leadership: How Danish humanities research education leaders constitute their roles
Keywords: Curriculum Development, Doctoral Education, Educational Policy, Higher Education
Presenting Author: Lynn McAlpine, University of Oxford / McGill University, Canada; **Co-Author:**Søren Bengtsen, Aarhus University, Denmark; **Co-Author:**Andrew Gibson, Trinity College Dublin, Ireland

Increasing government policy oversight of research education has led universities to establish central units, such as graduate schools, with their Heads responsible for leading research education. Yet, few studies on such leadership exist. Further, rarely are such studies case-based so examining the interaction between structural, disciplinary and individual influences. Thus our decision to conduct a case study of five Heads of Graduate Humanities Schools in five Danish universities: individuals responsible for interpreting and enacting external policies as well as creating and monitoring internal policies related to PhD education. We asked: How do these Heads constitute their roles? We used a narrative case-based framework examining the interplay between the individual's biography and the institution's history to understand how their own goals and responsibilities interacted with perceived structural factors such as Ministerial

regulations and institutional rules and strategies. While all were Heads, there were organizational differences in their job roles related to the profile and strategy of the specific university, as well as their own past experiences and values. They placed great reliance on their PhD experiences when articulating their perspectives: past PhD experience was the 'knowledge base' they drew on, rather than policy or best practice examples. As well, their general stance to policy was that of support. What was striking overall was their perspectives on change were largely individually-focused: as leaders, they saw their role as enabling individual student learning, rather than their role as engaging multiple players (e.g., supervisors, program leaders) to enable collective structural change.

Session P 11

25 August 2023 18:45 - 20:15
UOM_A08
Single Paper
Assessment and Evaluation, Motivational, Social and Affective Processes, Teaching and Teacher Education

Fostering Teachers' Attitudes towards Research and Scientific Inquiry

Keywords: Attitudes and Beliefs, In-service Teachers, Mindsets, Motivation, Pre-service Teachers, Quantitative Methods, Researcher Education, School Effectiveness, Science Education, Self-efficacy, Synergies between Learning / Teaching and Research, Teacher Efficacy, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development, SIG 17 - Methods in Learning Research
Chairperson: Jonas Dockx, KU LEUVEN, Belgium

Research use in the teaching profession: A systematic review
Keywords: In-service Teachers, School Effectiveness, Synergies between Learning / Teaching and Research, Teacher Professional Development
Presenting Author:Sølvi Mausethagen, Oslo and Akershus University College of Applied Sciences, Norway; **Presenting Author:**Hege Hermansen, Oslo Metropolitan University, Norway; **Co-Author:**Hanna Holmeide, Oslo Metropolitan University, Norway; **Co-Author:**Marte Lorentzen, Oslo Metropolitan University, Norway; **Co-Author:**Vera Niederberger, Pädagogische Hochschule Schwyz, Switzerland; **Co-Author:**Guri Skedsmo, Pädagogische Hochschule Schwyz, Switzerland

This paper presents a systematic review of 'research use' in education. As a policy construct, 'research use' has gained significant attention over the past decade. An often-stated assumption is that research use is important for strengthening educational quality in schools and improving educational outcomes. However, the concept of research use, and particularly its translation to practice, is often left undefined. This is problematic because it obscures the processes and dynamics that are at play as practitioners relate to research in their work and integrate research-based knowledge with other knowledge sources. In this systematic review, we examine published research that analytically foregrounds the *use* in research use, with two main objectives: First, we contribute to existing research by conceptually clarifying different dimensions of the term 'research use', the ways in which this concept has been applied in existing research, and the ways in which the concept has evolved over time. Second, the review documents how research use has been empirically investigated, and the assumptions about research use that guide researchers' approaches to this phenomenon. The review contributes to developing our conceptual understanding of 'research use', and of the ways in which practitioners are positioned with regard to the phenomenon of research use. The findings suggest that there is a need to challenge the linear reference frames frequently used by politicians and researchers when addressing research use, and to develop methodological and analytical approaches that can account for the integration of research and other knowledge sources for educational practitioners.

Combining a utility value and a mindset intervention to foster teachers' research motivation
Keywords: Attitudes and Beliefs, Mindsets, Motivation, Pre-service Teachers
Presenting Author: Helene Zeeb, University of Erfurt, Germany; **Co-Author:**Thamar Voss, University of Freiburg, Germany

Teachers often see little value in engaging with research methods and lack confidence in their own research skills. A utility value intervention could support them in developing more positive value beliefs; a growth mindset intervention could support their growth mindset and, in turn, their expectancy beliefs. Combining these two interventions could have an even stronger effect on beliefs and motivation. In this randomized field study, student teachers (N = 177) worked either on a utility value intervention (UVI), a growth mindset intervention (GMI), or a combined intervention (UV-GMI). All interventions were online and similar in structure and length. There were two follow-up sessions after eight and sixteen weeks. Results indicated that the UV-GMI was as effective as the single interventions with respect to fostering beliefs. However, there were no additional effects on motivation and performance at a statistics test. The UV-GMI supported especially student teachers with low competence beliefs. We conclude that the combined intervention could be a powerful tool for teacher educators who aim to foster future teachers' positive beliefs about engaging with research methods.

Teachers' beliefs, attitudes and engagement towards educational research - A longitudinal study
Keywords: Attitudes and Beliefs, Pre-service Teachers, Self-efficacy, Teacher Professional Development
Presenting Author: Karlien De Jaeger, KULeuven / EDU-Cel (main work address Kortrijk), Belgium; **Co-Author:**Mieke De Cock, KU Leuven - Department of Physics and Astronomy, Belgium; **Co-Author:**Wim Van Dooren, KU Leuven, Belgium

Engaging teachers with existing educational research and engaging them in conducting educational research is a professionalisation strategy that is important for themselves, their schools and the educational community. However, teachers often are negative about it.Teachers' beliefs regarding and attitudes towards educational research have a major influence on their (planned) behaviour. The current study wants to gain further insight in these beliefs and attitudes, as well as in the engagement of teachers with and in educational research. In particular, we investigate the evolution during the teaching career, starting in teacher education. This paper reports on the first steps of this longitudinal study: a survey study comparing the beliefs, attitudes and planned engagement of student-teachers before and after a course on educational research during their Master of Teaching programme. Results show that students think they will more likely engage with existing educational research than in conducting it, unless, as a teacher, they can collaborate with researchers. Their beliefs, including self-efficacy beliefs, and attitudes are strong predictors for the planned engagement.

Science Teachers' Beliefs about Teaching and Learning Science Content and Scientific Inquiry
Keywords: Attitudes and Beliefs, In-service Teachers, Pre-service Teachers, Science Education
Presenting Author: Verena Petermann, Justus Liebig University Giessen, Germany; **Co-Author:**Andreas Vorholzer, Technical University of Munich, Germany; **Co-Author:**Claudia von Aufschnaiter, Insitute of Physics Education, Germany

Fostering students' competencies regarding science content and scientific inquiry are both important goals of science education. However, it seems that in actual classroom practice, science content knowledge is typically addressed explicitly, but scientific inquiry knowledge is not. It can be assumed that this difference in teaching practice is at least in part related to teachers' beliefs about teaching and learning science content and scientific inquiry. This study investigated and contrasted teachers' beliefs regarding these two goals. Data was collected from N = 170 science teachers with an online questionnaire. After modelling the data and assessing the quality of measurement via Rasch analyses, t-tests were used to compare teachers' beliefs about teaching and learning science content and scientific inquiry. The results reveal that teachers' beliefs can vary considerably between both goals. For instance, teachers believe that explicitly addressing conceptual information is more important for teaching and learning science content than for teaching and learning scientific inquiry. Furthermore, teachers believe that they are more able to teach science content than to teach scientific inquiry. The presentation will provide an overview of the observed differences in teachers' beliefs. Implications for research and teacher education will be discussed.

Don't we need two control groups in large Randomized Controlled Trials?
Keywords: Quantitative Methods, Researcher Education, Teacher Efficacy, Teacher Professional Development
Presenting Author: Sarah Pariser, Université Paris 8, France; **Co-Author:**André Tricot, University Paul Valéry, Montpellier, France, France; **Co-Author:**Caroline Viriot-Goeldel, Universite Paris Est Creteil, France

Evidence-based practices have been irrigating research in education for decades, raising great hopes of improved efficiency of educational systems. However,

translating teaching practices proven effective in RCTs conducted by researchers into ordinary classrooms don't often achieve significant results with large effect sizes (James-Burdumy et al., 2009).
A literature review on this issue shows that new study designs have emerged, involving teachers in the design and/or the implementation phases, process evaluations complementing the quantitative measurement of the intervention (Connolly et al., 2018). Researchers collect information on how teachers appropriate the experimental teaching practices. Their experiment can be adjusted directly to real working conditions and target the teachers' zone of proximal development more accurately (Bryck, 2015). Translating those experiments then has greater chances to be efficiently implemented in ordinary practices.
This paper specifically focuses on how to select participants in this type of study design, where the experiment is facilitated by regular teachers. Participants are often volunteer teachers, randomly assigned to an experimental or a control group (Banerjee & Duflo, 2009). A paired control group can also be recruited among non volunteer teachers, in order to reflect the ordinary practices. This paper explores the pros and cons of these two solutions to constitute a control group and suggests a promising third: comparing the experimental group to two control groups: (a) a group of volunteer teachers, randomly assigned (b) a non volunteers group, paired to the experimental group. We describe a study using this method with 43 classrooms and 982 middle school students.

Session P 12

25 August 2023 18:45 - 20:15
AUTH_T102
Single Paper
Higher Education, Teaching and Teacher Education

Informal Learning in Vocational and Workplace Settings

Keywords: Higher Education, In-service Teachers, Informal Learning, Lifelong Learning, Mentoring and Coaching, Mixed-method Research, Quantitative Methods, Teacher Professional Development, Vocational Education and Apprenticeship Training
Interest group: SIG 04 - Higher Education, SIG 14 - Learning and Professional Development
Chairperson: Natalie Boelen, Hogeschool PXL, Belgium

Learning from errors in vocational education and training
Keywords: Informal Learning, Lifelong Learning, Quantitative Methods, Vocational Education and Apprenticeship Training
Presenting Author: Veronika Anselmann, University of Education Schwäbisch Gmünd, Germany

While errors in schools are often seen as important source for learning, errors at nurses´ workplace can have severe consequences for patients´ health. In Germany nurses´ vocational education and training (VET) consists of a mainly school based theoretical part and a practical component where trainees work in hospitals. Learning from errors at work is based on the concept of experiential learning and includes developing strategies for error prevention and reflection about the causes. An error-friendly learning climate at schools can be described as teachers´ and learners´ perception of errors as an important part of learning. While studies found out what factors facilitate learning from errors at work (Rausch et al., 2022), less is known how an error-friendly climate in schools can influence nursing trainees´ learning from errors. Therefore, this study wants to find out if an error-friendly climate at schools can influence nursing trainees´ learning from errors at work. 374 nursing trainees (N=374) participated in a cross-sectional questionnaire study with an online questionnaire. Results of our structural equation modelling indicate that beside contextual and individual components, error climate can influence trainees´ learning from errors at work. Nursing trainees´ learning from errors can be fostered in their theoretical and practical part of their training.

In-service student teacher competency development: the impact of an adapted guidance approach
Keywords: In-service Teachers, Informal Learning, Mentoring and Coaching, Mixed-method Research
Presenting Author: Katrien Cuyvers, University of Antwerp, Belgium; **Presenting Author:**Tom Smits, University of Antwerp, Belgium; **Co-Author:**Hannes Van der Linden, University of Antwerp, Belgium; **Co-Author:**Sabrina Govaerts, AP University of Applied Sciences and Arts Antwerp, Belgium; **Co-Author:**Barbra Schits, AP University of Applied Sciences and Arts Antwerp, Belgium

Workplace learning has long been a substantial part of teacher education. In Flanders, in-service student teachers are employed as teachers in a school while simultaneously being enrolled in a teacher education programme. For in-service student teachers to effectively learn from teaching practice and teaching activities, self-regulation of workplace learning (SRwpL) is assumed to be of major importance. SRwpL is evoked by work and refers to the ability to engage in different strategies that shape the learning process dynamically unfolding over time. Research shows that the education and guidance of (self-regulated) workplace learning of in-service student teachers is very challenging leading to different needs of the actors involved with the need of an adapted guidance approach coming to the fore. This study aimed to strengthen teacher education by developing such an adapted guidance approach, and investigate the impact of different elements from this approach performed by mentor coaches and supervisors on the development of SRwpL and basic competencies of in-service student-teachers. A single-case adapted alternating treatments design with time-series repeated quantitative and qualitative measures of SRwpL and the basic competencies of in-service student teachers were used. Data are being collected between September 2022 and March 2023. Consequently, no findings can be reported on yet. Nevertheless, since this projects ends on August 31st, 2023 and the report should be finalised by that time, we aim to report on all the findings at the EARLI-conference.

A Diary Study on Formal and Informal Learning Opportunities for Teachers in Vocational Schools
Keywords: Informal Learning, Lifelong Learning, Quantitative Methods, Teacher Professional Development
Presenting Author: Manuel Böhm, Universität Mannheim, Germany; **Co-Author:**Andreas Rausch, University of Mannheim, Germany

There is little research on teachers' learning in vocational schools. It is argued that the traditional approach of formal and non-formal teacher training does not fit the current state of research. Therefore, the focus lies on informal vocational teacher learning. Moreover, the importance of informal learning is stressed (Imants & van Veen, 2010, p. 569; Kwakman, 2003, p. 150). In a diary study with a developed teacher task framework, vocational teachers reported their daily professional tasks as well as their according level of perceived learning, stress, and coping. Of interest are (RQ1) the time teachers invest into formal and non-formal learning activities and (RQ2) the daily work tasks teacher perceive as conducive. It was found that teachers invest 0.98 hrs into formal and 0.36 hrs into non-formal learning. Furthermore, the perceived distress and perceived learning during daily teacher tasks and their changes across the different categories is examined. The most stressful teacher tasks are in line with the literature on teacher stress. The found teacher learning activities confirm findings from other studies. Based on the learning hypothesis (Karasek, 1979) and the transactional model of stress (Lazarus & Folkman, 1984), stress and coping are assumed as predictors of the perceived learning. It is therefore (RQ3) checked whether stress and coping predict informal learning in teachers' daily work tasks. Stress and coping as well as their interaction term were found to be significant predictors of the perceived learning, (R^2 = .07, $F(3, 10468) = 263{,}36$, $p < .001$).

Exploring the integration of theory and practice in work-based learning
Keywords: Higher Education, Informal Learning, Lifelong Learning, Mixed-method Research
Presenting Author: Zsuzsa Kovács, Eötvös Loránd University, Budapest, Hungary; **Co-Author:**Emese Schiller, Eötvös Loránd University, Hungary; **Co-Author:**Nóra Hegyi-Halmos, Eötvös Loránd University, Budapest, Hungary

Work-based learning enables a powerful connection between the labour market and higher education institutions. The integration of work-based learning into higher education programs has gained importance. This paper thus aims to present initial results of a pilot research project that outlines Hungarian university students' experiences and learning outcomes of work-based learning in the mandatory practicum within a master's degree program. This exploratory study, containing both questionnaire and interview sub-studies, was conducted with the overarching aim to explore (1) how theory-based training and work-based learning are integrated and (2) by what means the mandatory practicum may contribute to the practical application of the knowledge acquired in formal university education. Results show a diversity in terms of students' prior work experience which may also imply diverse learning paths.Keywords: professional identity, work-based learning, theoretical and practical training in higher education

Session P 13

25 August 2023 18:45 - 20:15
UOM_A05
Single Paper
Assessment and Evaluation, Teaching and Teacher Education

Teachers and Teaching during the COVID-19 Pandemic II

Keywords: Attitudes and Beliefs, Competencies, E-learning/ Online Learning, Emotion and Affect, Higher Education, Large-scale Assessment, Pandemic, School Effectiveness, Social Aspects of Learning and Teaching, Social Development, Teacher Effectiveness, Teacher Efficacy, Teaching/Instructional Strategies, Well-being
Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education, SIG 13 - Moral and Democratic Education
Chairperson: Isabelle Kalkusch, Switzerland

A Systematic Review of Empirical Studies Examining the Teaching Profession in the COVID-19 Pandemic
Keywords: Competencies, E-learning/ Online Learning, Pandemic, Teaching/Instructional Strategies
Presenting Author: Sherry Shilon, the Open University of Israel, Israel; **Co-Author:**Ayelet Becher, the Open University of Israel, Israel; **Co-Author:**Tali Aderet-German, Ben Gurion University of Negev, Israel

The COVID-19 pandemic has brought increased uncertainties viewed as either a liability or an asset to the teaching profession. In this systematic review, we explored the external and internal factors that shaped the teaching profession during COVID-19 pandemic. Qualitative, quantitative, and mixed methods empirical studies published in 2020-2022 were obtained from various databases, namely, ISI Web of Science core collection, Education Resources Information Centre (EBSCO), SCOPUS, and PsycINFO (EBSCO) as well as from leading journals in the field of teaching and education research. Upon executing careful selection criteria, 112 articles were selected for review. Findings indicate six emerging themes and analysis adopts Glazer's inside-out view of professionalism, relying on Abbott's framework of jurisdictional strength. This review will be helpful for educational policy makers and educators to gauge the opportunities and challenges which increase and decrease the profession's strength and may serve as a hope in shaping the future of the teaching profession from within.

Teacher educators' experiences and well-being during COVID-19 online teaching
Keywords: E-learning/ Online Learning, Higher Education, Teacher Efficacy, Well-being
Presenting Author: Marjaana Veermans, University of Turku, Finland; **Co-Author:**Piia Naykki, University of Jyväskylä, Finland; **Co-Author:**Anne-Maria Korhonen, Hamk University of Applied Sciences, Finland; **Co-Author:**Eetu Lehtiö, University of Turku, Finland; **Co-Author:**Lauri Salo, University of Turku, Finland

This study explored how teacher educators experienced online teaching practices during COVID-19 pandemic, and how the experiences reflected to their well-being. Three Finnish teacher education universities with 17 teacher educators participated in the study. The data were collected first by the self-assessment tool that aimed to increase teachers' awareness of their teaching practices that may also reflect their well-being. Second, the focus group interviews related to online teaching and well-being were conducted online. The theory- and data-driven content analysis were implemented. The findings indicate challenges, but also positive approaches for online teaching. Teacher educators highlighted a challenge to follow students' emotional reactions and their individual needs for guidance and scaffolding. The fact that students switched off cameras during the online teaching resulted in a lack of communication. Furthermore, the need to prepare and design online teaching sessions and learning activities with details and a structured way was highlighted. This requirement also had a parallel role to positively impact teacher educators' competence development. Teachers experienced their new role as an online teacher inspiring and supportive for their professional development. Teachers viewed that their well-being was increasing due to online teaching brining certain flexibility to everyday life, and easiness of transitions. This study provides knowledge for developing teacher education and teacher educators' possibilities to design and implement successful online teaching and learning activities. The implications of this study highlight a need for analyzing and revising online teaching practices in order to have students actively participating in online sessions.

Effects of the COVID-19 pandemic on social-emotional skills of students from a teachers' perspective
Keywords: Emotion and Affect, Pandemic, Social Aspects of Learning and Teaching, Social Development
Presenting Author: Birgitta Kopp, Ludwig-Maximilians-University, Germany; **Co-Author:**Annika Lueg, Ludwig-Maximilians-Universität (LMU), Germany

In this study, we investigated social-emotional skills of students due to the Corona pandemic from a teachers' perspective using qualitative interviews. First, teachers evaluated social-emotional skills of their students regarding individual and social aspects due to Corona. And second, further effects of Corona on student's social-emotional development were gathered. Nine teachers from diverse primary and secondary schools in Germany were interviewed using an interview guideline for answering these questions. All interviews were transcribed and analysed using MAXQDA. A coding scheme was developed deductively using theoretical assumptions regarding social-emotional learning, and inductively using the data set. Two coders double rated 30 per cent of the transcripts. Inter-rater reliability was high with r=.93. Results show that all teachers value social-emotional skills as very important for establishing a good learning atmosphere in class. During the pandemic, teaching with digital devices had been realized which reduced social-emotional issues in classrooms. Thus, from a teachers' perspective, students' social-emotional skills declined regarding the individual level of self-controlling emotions, and the social level of building relationships and showing empathy. Furthermore, regarding students' social-emotional development, depressions and aggressions increased, especially regarding kids with parents having a lower socio-economic status and giving lower social-emotional support during the pandemic. This interview study shows the importance of stressing social-emotional learning using explicit training methods to improve students' skills as they decreased during the pandemic.

Student perceptions of teaching quality during the COVID-19 pandemic in Indonesia
Keywords: Attitudes and Beliefs, Large-scale Assessment, School Effectiveness, Teacher Effectiveness
Presenting Author: Maria Teodora Ping, Mulawarman University, Indonesia; **Co-Author:**Anindito Aditomo, Educational Standards, Curriculum and Assessment Agency, MOECRT and University of Surabaya, Indonesia; **Co-Author:**Irsyad Zamjani, Centre for education standard and policy, MOECRT, Indonesia; **Co-Author:**Asrijanty Asrijanty, Center for Education Assessment, MOECRT, Indonesia; **Co-Author:**Tri Lestari, Widya Mandala Catholic University, Indonesia; **Co-Author:**Anita Lie, Widya Mandala Catholic University, Indonesia; **Co-Author:**Ridwan Maulana, GION - University of Groningen, Netherlands

The present study aims to investigate student perceptions of teaching quality from Indonesian perspectives, by taking into account similarities and differences across education levels, geographic locations, and school type. Teaching quality was measured using a three-dimensional questionnaire initially developed in the German context including Classroom Management, Student Support, and Cognitive Activation. A total of 6,758,399 students from 256,366 schools across Indonesia were surveyed during the 2021/2022 school year. Descriptive analysis and ANOVA were performed. Results reveal a significant difference ($p < 0.0005$) in student perceptions across education levels, geographic locations as well as school types- albeit with a meager effect size. Furthermore, the differences in student perceptions towards all of teachers' teaching quality dimensions between effective (top 20%) and less effective (bottom 20%) schools were found to be significant. This study paves the way for improving the quality and equity of learning environments in Indonesia.

Session P 14

25 August 2023 18:45 - 20:15
UOM_R08
Single Paper
Higher Education, Learning and Instructional Technology, Teaching and Teacher Education

Eye Tracking and Online Measures of Learning Processes

Keywords: Cognitive Skills and Processes, Comprehension of Text and Graphics, Educational Technologies, Eye Tracking, Instructional Design, Mixed-method Research, Sustainable Development, Teacher Effectiveness
Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 27 - Online Measures of Learning Processes
Chairperson: Fien De Smedt, Ghent University, Belgium

Culture, pedagogy, and cognition: Think-aloud analysis of cultural differences in teacher cognition
Keywords: Cognitive Skills and Processes, Eye Tracking, Mixed-method Research, Teacher Effectiveness
Presenting Author: Nora McIntyre, University of Southampton, United Kingdom; **Co-Author:**Phyllis Lau, University of Southampton, United Kingdom; **Co-Author:**Davy Tsz Kit Ng, The University of Hong Kong, Hong Kong

Think-aloud is a methodology with unique potential to generate exceptional insight into teacher expertise. By obtaining think-aloud verbalisations, expertise researchers are able to trace each moment of what can be regarded as 'optimal' task performance as cognitive dimensions are identified that support expert task performance in classroom teaching. The present study adapts an existing framework for teacher cognition to think-aloud elicited by gaze-cued own-perspective videos. In doing so, the present study asks to what extent does a framework for teacher cognition that has been applied to Western European teachers also applies to East Asian teachers in Hong Kong. Additionally, how does the teacher cognition of Hong Kong experts differ from that of Hong Kong novices, and what are the cultural differences in expert teacher cognition when comparing teachers in the UK with those in Hong Kong? Thus, this study address the preoccupation with Western European trends and populations in the field of Educational Psychology. This study also advances methodology for educational research by applying pioneering and rigorous mixed methods to investigate processes which are core to learning and instruction.

Prior knowledge predicts students' learning and later systems thinking skills of wicked problems
Keywords: Cognitive Skills and Processes, Comprehension of Text and Graphics, Eye Tracking, Sustainable Development
Presenting Author: Tomi Kiviluoma, University of Helsinki, Finland; **Presenting Author:**Ilona Södervik, University of Helsinki, Finland; **Co-Author:**Riitta Savolainen, University of Helsinki, Finland; **Co-Author:**Helena Åström, University of Helsinki, Finland

This study combined longitudinal and individual process-level analyses to investigate the development of expertise among university biology students (N = 33) during their bachelor studies. Open-ended tasks measuring students' conceptual understanding regarding photosynthesis and evolution was repeated three times during the bachelor studies. Additionally, a case task including scientific research material and questions concerning a multifaceted and complex phenomenon, that is the effects and challenges of the climate change for the forest ecosystems, was used. The processing of the case task material was investigated using eye-tracking. The results showed that students with deeper conceptual understanding in the beginning of the university studies succeeded better also in the third study year both in the conceptual understanding tasks and in the case task that required systemic thinking and applying of conceptual knowledge. Additionally, longer reading times regarding the sentences presenting conflicting information was related to weaker success in considering the expected challenges and effects of warming climate for forests. The result might indicate about certain students' difficulties in processing material that includes conflicting knowledge and hence, their weaker systems thinking skills. Further, the results of this study indicate that conceptual understanding and systems thinking skills are related in aiming to understand complex, wicked problems such as climate change. The results also highlight the importance of early support, since the level and quality of prior knowledge seems to predict later success both regarding basic conceptual knowledge and related systems thinking skills.

Hybrid explanatory animations: Anti-cued context improves compositional design
Keywords: Comprehension of Text and Graphics, Educational Technologies, Eye Tracking, Instructional Design
Presenting Author: Jean-Michel Boucheix, University of Dijon, LEAD-CNRS, France; **Co-Author:**Richard Lowe, Curtin University, Australia

A recent composition approach for designing complex educational animation lead to an improvement of learner's mental model quality, compared to the conventional animation design based on the presentation of comprehensive realistic behaviour of the content to be learnt. However, this improvement remained suboptimal. In a previous experiment the effectiveness of a hybrid design that selectively combined features of the composition and of the comprehensive approaches by using anti-cueing was tested. Three groups of participants were presented either the original composed version of an upright piano mechanism or an anti-cued version or a comprehensive version (control group). Results showed the hybrid version was the best learning condition, but despite control of information exposure across conditions, participants who self-launched each animation cycle spent longer studying animation in the Hybrid and Compositional animations than the Conventional animation. Therefore, in the second present study, a strictly equal study time (system-paced) was used with the three previous conditions as well as with a fourth condition that presented event units' pairs along the causal chain in a progressive cumulative manner ('snowball accretion'). Learners eye movements were also recorded during animation study time in order to address perceptual and cognitive processing. Results of study 2 demonstrate that the Hybrid version produced the best learning, even better than the Compositional version. The Cumulative version did not differ from the Comprehensive control condition. The two studies showed very similar results.

Session P 15

25 August 2023 18:45 - 20:15
UOM_R05
Single Paper
Learning and Special Education, Motivational, Social and Affective Processes

Anxiety and Stress in Students with Special Educational Needs

Keywords: Anxiety and Stress, At-risk Students, Emotion and Affect, Higher Education, Learning and Developmental Difficulties, Learning and Developmental Disabilities, Resilience, Secondary Education, Social Interaction, Special Education
Interest group: SIG 15 - Special Educational Needs
Chairperson: Judith Gulikers, Wageningen University, Netherlands

School stressors in adolescents with Specific Learning Disorders: frequency and vulnerability
Keywords: Anxiety and Stress, Emotion and Affect, Higher Education, Learning and Developmental Disabilities
Presenting Author: Valentina Tobia, Vita-Salute San Raffaele University, Italy; **Co-Author:**Michela Moretti, Vita-Salute San Raffaele University, Italy; **Co-Author:**Martina Lattanzi, Vita-Salute San Raffaele University, Italy; **Co-Author:**Anna Lucia Ogliari, Vita-Salute San Raffaele University, Italy

Are students with Specific Learning Disorders (SLD) more exposed than their peers to stressful episodes in the school context? If this is the case, stressors of which nature? How much do they feel vulnerable to these stressors? These research questions were investigated through the administration of an adaptation of the School stressors questionnaire (Agrawal et al, 2010) to an Italian sample of 235 high school students (75,7% females; mean age = 16,21± 1,64 years) half of whom were students with SLDs. The questionnaire investigated (1) vulnerability to and (2) frequency of academic and disciplinary stressors, as well as stressors related to relationships with their peers and teachers. Also, children's learning self-reported skills were measured. Results showed that students with SLDs experienced more often academic stressors, compared to controls, whereas they refer more vulnerability to stressors in the area of teacher relationships. A pattern of positive associations between learning difficulties and vulnerability/frequency of some of the questionnaire's subscales was found. Implications of these results for school well-being and learning of students with SLD are discussed.

Anxiety in students with intellectual disabilities: The influence of social acceptance and rejection
Keywords: At-risk Students, Emotion and Affect, Social Interaction, Special Education
Presenting Author: Verena Hofmann, University of Fribourg, Switzerland

Students with intellectual disabilities often exhibit increased anxiety levels, which can be associated with additional limitations and severe emotional distress. This study investigated the role of social acceptance, social rejection, and general functioning in predicting anxiety. Using data on 1,125 students in 179 special

needs classrooms that was collected at the beginning and end of one school year, multilevel models were used to predict whether future anxiety was associated with prior social acceptance or rejection by classmates, and with general functioning. We found that greater social acceptance was related to a decrease in anxiety over the school year, however, no effect was found for social rejection. Further, there was no moderating effect of students' general functioning. Positive peer relationships in the classroom appear to contribute to less anxiety, while negative relationships do not seem to further worsen anxiety.

Resilience and its association to loneliness in adolescents with and without learning difficulties
Keywords: Emotion and Affect, Learning and Developmental Difficulties, Resilience, Secondary Education
Presenting Author: Filippos Papazis, National and Kapodistrian University of Athens, Greece; **Co-Author:**Anastasia Vlachou, Department of Educational Studies, National and Kapodistrian University of Athens, Greece; **Co-Author:**Panayiota Stavroussi, Department of Special Education, University of Thessaly, Greece

Resilience can be defined as a process for positively adapting to different types of hardships and difficulties. Learning difficulties (LD) constitute a risk factor for resilience, as students with LD experience loneliness and social dissatisfaction due to their marginalization by peers. The aim of this study was to investigate resilience in adolescents with and without LD, as well as its relationship with their sense of loneliness and social dissatisfaction. The study also aimed to examine whether resilience, loneliness and social dissatisfaction are influenced by demographic characteristics. The "Resilience Scale" and the "Loneliness and Social Dissatisfaction Scale" were used for collecting data. The sample consisted of 862 students of typical development and 288 students with LD originated from Attica, Greece. The results indicated that students with LD were less resilient and were experiencing more loneliness and social dissatisfaction in comparison to their typically developing peers. Gender was found to influence some factors of resilience in both groups of students, while no statistically significant difference between boys and girls was observed regarding the feeling(s) of loneliness and social dissatisfaction. School performance was found to influence some factors of resilience in both groups of students. No statistically significant difference was observed in relation to feeling(s) of loneliness and social dissatisfaction in students with LD, while statistically significant difference was observed regarding feelings of loneliness in students without LD. The results of the study are discussed in relation to the development of counseling support systems necessary for the enhancement of resilience among adolescents.

Session P 16

25 August 2023 18:45 - 20:15
UOM_A07
Single Paper
Instructional Design, Learning and Instructional Technology

Comprehension of Text and Graphics through Multimedia Learning

Keywords: Cognitive Skills and Processes, Comprehension of Text and Graphics, Educational Technologies, Emotion and Affect, Instructional Design, Multimedia Learning, Reading, Vocational Education and Apprenticeship Training
Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 14 - Learning and Professional Development
Chairperson: Fotini Bonoti, University of Thessaly, Greece

Reading research meets multimedia: text-picture combinations are validated automatically
Keywords: Cognitive Skills and Processes, Comprehension of Text and Graphics, Multimedia Learning, Reading
Presenting Author: Anne Schueler, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Pauline Frick, Leibniz-Institut für Wissensmedien (IWM), Germany

During reading, automatic validation processes verify whether the integration of a currently read sentence with information read before is meaningful. It is still an open question whether validation processes also occur when processing text and pictures (i.e., multimedia materials). To answer this question, we conducted two experiments, where we used the epistemic Stroop paradigm (Richter et al., 2009). The underlying rationale of this paradigm is that automatic validation processes can induce positive or negative response tendencies in the reader. These response tendencies make it difficult to respond to another unrelated task, if this task requires the opposite response. In our experiments, participants were presented with sentence-picture (Experiment 1) or text-picture (Experiment 2) combinations. The sentence/text either matched (valid version) or mismatched (invalid version) the accompanying picture. After each combination, participants had to perform an unrelated task, that is, they had to react to the probe words right or wrong. This resulted in a 2x2 within subjects design with the factors validity (valid vs. invalid) and probe word (right vs. wrong).
Results showed that after matching items the reaction time to the probe word "wrong" was significantly slower than to the probe word "right" (Experiment 1 & 2). Further, after mismatching items the error rates for the probe word "right" were higher than for the probe word "wrong" (Experiment 1). These findings are in line with the assumed validation mechanism and corroborate the assumption that validation processes also occur when processing text-picture combinations.

Aesthetics of illustrations in emotional design: effects on user experience and multimedia learning.
Keywords: Comprehension of Text and Graphics, Educational Technologies, Emotion and Affect, Multimedia Learning
Presenting Author: Julien Venni, University of Geneva, Switzerland; **Co-Author:**Mireille Bétrancourt, University of Geneva, Switzerland

Research on emotional design has studied several principles to make visual illustrations more appealing, with mixed results regarding learning outcomes. As no previous study has systematically assessed the effect of each of these principles considered separately on aesthetic judgement, an online experimental study was conducted to evaluate the perceived beauty of illustrations varying according to 3 variables: colours (harmonious, non-harmonious, greyscale), anthropomorphism (with, without) and dimensionality (2D, 3D). Participants (N = 100) evaluated on a 7-point likert scale 12 versions of 5 items resulting in 60 trials. Results showed a significant effect of each variable on the perceived aesthetics of the illustrations, as well as an interaction between dimensionality and anthropomorphism. More specifically, we observed that harmonious colours, without anthropomorphism, in 3D representation are the most aesthetically appealing dimension of emotional design. Moreover, the findings challenge the benefits of integrating anthropomorphism in multimedia illustrations. Further research is being conducted combining in an instructional web site the most aesthetically appealing combination of each feature versus the least ones in order to investigate the effects of aesthetics on user experience, learning processes (eye tracking, navigation) and outcomes.

Interactive Dynamic Visualizations – Evidence from an Experimental Study
Keywords: Comprehension of Text and Graphics, Instructional Design, Multimedia Learning, Vocational Education and Apprenticeship Training
Presenting Author: Stefanie Findeisen, University of Konstanz, Germany; **Presenting Author:**Josef Guggemos, University of Education Schwäbisch Gmünd, Germany

Visualizations facilitate the learning of new content. They make it possible to link verbal information with visual representations. However, when it comes to illustrating dynamic processes, conventional (static) visualizations reach their limits. Dynamic visualizations could address this problem, especially if learners can control the presentation themselves (interactive, dynamic visualizations). A recent literature review has revealed several important open questions concerning interactive, dynamic visualizations. These mainly concern the investigation of learning processes and the conditions under which interactive, dynamic visualizations become effective for learning. To answer these questions, we have developed an online-based learning platform in the field of economic education. The visualizations are dynamic graphs of economic models where students can actively manipulate the parameters of supply and demand curves. In an experimental design with n = 200 learners conducted in a laboratory, we compare interactive dynamic graphs to static graphs. Using pre- and posttests, we can capture the development of student cognitive and non-cognitive outcomes. Embedded-experience sampling and extensive process data allows us to open the black box of the learning processes. Analyses show that the way students interact with interactive, dynamic visualizations varies substantially. Our research has implications for theory and practice. In terms of theory, we can shed light on the conditions under which interactive, dynamic visualizations yield positive results. In terms of practice, teachers can use the platform we have developed in their teaching of complex phenomena in economics for commercial trainees in vocational education.

Session P 17

25 August 2023 18:45 - 20:15
AUTH_T202
Single Paper
Cognitive Science, Learning and Instructional Technology, Teaching and Teacher Education

Video-based Learning: Supporting Teachers and Students

Keywords: Classroom Management, Competencies, Comprehension of Text and Graphics, Computer-assisted Learning, Example-based Learning, Feedback, Multimedia Learning, Pre-service Teachers, Primary Education, Reading, Video-based Learning
Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 11 - Teaching and Teacher Education
Chairperson: Juming Jiang, The University of Hong Kong, Hong Kong

Fostering student teachers' expert-like video analyses to develop professional vision
Keywords: Classroom Management, Competencies, Example-based Learning, Pre-service Teachers
Presenting Author: Jasmin Lilian Bauersfeld, TU Dortmund, Germany; **Co-Author:**Bernadette Gold, TU Dortmund University, Germany

Expert teachers interpret classroom events adequately, focus on students' on-task behavior and learning, and take multiple perspectives when analyzing classroom events. Student teachers have difficulties to analyze classroom events and do not implement expert features (EF) in their analyses. Instructional principles, such as worked examples, could support student teachers in deriving EF from an expert worked example of a classroom analysis (WECA) and transfer them to their own video analysis to presumably develop professional vision. Instructional explanations, prompts for self-explanation, and fading EF in the WECA could lead to more effective processing of the WECA. In the study, 410 student teachers either received no WECA, received a complete WECA or a faded WECA of a classroom event, which they had to study prior to analyzing videos. Results show that student teachers could improve their use of EF in their analyses of classroom situations. The experimental groups, which received a WECA, were able to generate more expert-like analyses of classroom events than a control group. They used more EF in their interpretations and stayed on the same low level in focusing on on-task behavior and learning. The control group addressed significantly less students' on-task behavior and learning and used less EF in their interpretations. However, there were no differences between the experimental groups. The results reveal that student teachers could be instructionally supported by a WECA in their analyses of classroom events. Further findings on the influence of EF as a mediator for developing professional vision and limitations will be addressed.

Using videos in training fourth grade children's inferencing skills
Keywords: Comprehension of Text and Graphics, Primary Education, Reading, Video-based Learning
Presenting Author: Brechtje van Zeijts, Erasmus University Rotterdam, Netherlands; **Co-Author:**Dianne Venneker, Leiden University, Netherlands; **Co-Author:**Lesya Ganushchak, Erasmus University Rotterdam, Netherlands; **Co-Author:**Björn de Koning, Erasmus University Rotterdam, Netherlands; **Co-Author:**Huib Tabbers, Erasmus University Rotterdam, Netherlands

Inference-making is considered a central element of reading comprehension (McNamara & Magliano, 2009). The ability to draw inferences is not only important for understanding written text, but also for understanding other forms of language, such as audio narratives and videos (Kendeou et al., 2020). The present study aimed to explore whether children's inference skills can be effectively trained using videos. Thirty-five fourth grade children were randomly assigned to either a video-based training, a text-based training, or a no-training control group. Children in the two training groups followed four lessons about making knowledge-based inferences, either with texts or with videos. Before and after the training, all children completed an inference test in video format ánd in text format, and they made a general reading comprehension test. The results showed that our text-based training was effective in improving children's inference skills with texts, replicating previous inference studies (e.g., Bos et al., 2016). However, the text-based training did not result in improved inference skills with videos, indicating that there was no transfer across media. Unfortunately, for children in the video-based group we found no improvements in inference skills, neither with videos nor with texts. Regarding children's reading comprehension skills, we found that all children improved from pretest to posttest, including the control group. This suggests a natural development over time unrelated to our training programs. We are currently conducting a follow-up training study with a larger sample size and more lessons focused on individual practice.

Using a 360° hypervideo for peer analysis of healthcare professional practice. An explorative study
Keywords: Comprehension of Text and Graphics, Computer-assisted Learning, Multimedia Learning, Video-based Learning
Presenting Author: Francesca Amenduni, Swiss Federal University for Vocational Eduation and Training (SFUVET), Switzerland; **Co-Author:**Vito Candido, SFUVET, Switzerland; **Co-Author:**Rita Cosoli, SFUVET, Switzerland; **Co-Author:**Alberto Cattaneo, Swiss Federal University for Vocational Education and Training, Switzerland

In this exploratory study, we observed how vocational education healthcare learners (N = 24; F = 22; Average age = 18; SD =.97) used an interactive 360° video (360HV) to analyse the professional practice of a peer engaged in the performance of blood sampling. The 360HV allows to change the user's perspective from a 360° video (360V) which includes all the procedure of blood sampling to a standard video, focused on the vein's details. Students were divided into 6 groups aiming at analysing the professional practice of a peer in the 360HV. The group discussion was audio-recorded together with the screencast of the 360HV the students watched during the analysis. Preliminary results show a substantial variability within the six groups in their behaviour toward the 360HV which seems to correspond to the adoption of different strategies of analysis. Results also show that while watching a 360HV, the groups discussed more about socio-emotional aspects and environmental elements compared to when they watched a standard video. Conversely, while watching the standard video, generally groups discussed more about the medical-technical procedure and errors compared to when they watch the 360HV. Results of qualitative content analysis will be triangulated with results of the topic modelling and content network analysis in order to present a deeper understanding of the inquiry processes.

Effects of expert feedback type on students' professional vision and self-efficacy
Keywords: Competencies, Feedback, Pre-service Teachers, Video-based Learning
Presenting Author: Christopher Neil Prilop, Aarhus University, Denmark

Teachers require classroom management skills to provide effective learning environments for their students. Numerous studies have shown teachers' self-efficacy is positively related to effective teaching. Furthermore, it is assumed that teachers need professional vision of classroom management (PVCM) to maintain effective learning environments. Various studies have shown that video analysis supported by expert feedback can increase PVCM and self-efficacy. However, little is known about which type of feedback best promotes student teacher self-efficacy and PVCM. Therefore, the present study examines the following questions in a pre-post-intervention-design:(1) To what extent do student teachers improve their PVCM with tutorial expert feedback (intervention group: IG) or evaluative expert feedback (control group: CG)?(2) To what extent does tutorial expert feedback (IG) or evaluative expert feedback (CG) increase the self-efficacy of student teachers?56 student teachers took part in two identical courses in which they analyzed classroom videos. In response to the written analyses, the IG students (n=26) received written, tutorial expert feedback, while CG students (n=30) received written, evaluative expert feedback.Analyses showed that the students in both groups improved significantly in terms of PVCM. A significant interaction effect showed that CG students improved their PVCM more compared to IG students. Analyses of student self-efficacy showed no significant time or interaction effect. The study was able to show that evaluative expert feedback promoted the PVCM of student teachers better than tutorial expert feedback. The results suggest that feedback that provides too much information could make students passive and hinder their development.

Session P 18

25 August 2023 18:45 - 20:15
UOM_A13
Single Paper

Motivational, Social and Affective Processes

Student Motivation and Achievement: Evidence from Different Theoretical Perspectives

Keywords: Achievement, Cognitive Skills and Processes, Competencies, Meta-analysis, Mindsets, Motivation, Secondary Education, Self-concept, Self-determination, Self-efficacy
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Maria Cutumisu, University of Alberta, Canada

On the Joint Effects of Social, Dimensional, and Temporal Comparisons: A Longitudinal Experiment
Keywords: Achievement, Cognitive Skills and Processes, Competencies, Self-concept
Presenting Author: Fabian Wolff, Universität of Koblenz, Germany

This research examined the joint effects of social comparisons (comparisons of one's achievements with those of others), dimensional comparisons (comparisons of one's achievements in different domains), and temporal comparisons (comparisons of one's achievements across time) on students' ability assessments. For the first time a longitudinal experiment (N = 411) was conducted to examine these comparison effects on students' own self-concepts, inferred self-concepts of another student, and assessments of another student's actual abilities in the figural and verbal domains. Regression analyses revealed significant social and dimensional comparison effects on the different kinds of ability ratings in both domains. These effects resulted from higher domain-specific ability assessments following downward rather than upward comparisons (i.e., comparisons with lower rather than higher achievements of others or in the other domain, respectively). However, most temporal comparison effects were nonsignificant. The social comparison effects were stronger than the dimensional comparison effects. Moreover, the social comparison effects were stronger, and one dimensional comparison effect was weaker, when students assessed the other student's actual abilities, rather than inferring this student's self-concepts.

Expectancy-Value Constructs and Basic Needs as Predictors for Performance in Data-Based Modeling
Keywords: Achievement, Motivation, Secondary Education, Self-determination
Presenting Author: Matthias Mohr, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Stefan Ufer, Ludwig-Maximilians-Universität (LMU), Germany

In a student laboratory on data-based modelling, situation-specific expectancies, task values, and cost beliefs as well as factors of situational experience (fulfillment of basic needs) from secondary school students (N=369) are examined to explain inter-individual differences in motivated behavior (state motivation and effort) and in data-based modeling achievement, controlling prior knowledge. The paper describes a framework which takes up constructs from situated expectancy-value theory and self-determination theory to explain these inter-individual differences. The results show that expectancies, task values, and costs are important antecedents of the experience of the learning situation (fulfillment of basic needs), and that basic needs fulfillment acts as a mediator to explain differences in motivated behavior and performance.

How Do Mindset Beliefs Relate to Other Forms of Motivation?
Keywords: Achievement, Meta-analysis, Mindsets, Motivation
Presenting Author:BENGU CILALI, Bilkent University, Turkiye; **Co-Author:**Aikaterini Michou, University of Ioannina, Greece, Greece; **Co-Author:**Martin Daumiller, University of Augsburg, Germany; **Co-Author:**Chris S. Hulleman, University of Virginia, United States; **Co-Author:**Kenn Barron, James Madison University, United States; **Co-Author:**Claudia C. Sutter, University of Virginia, United States

Abstract Certain motivational mechanisms enable individuals to persevere in their academic endeavors. In the present meta-analysis, we aimed to better understand the associations between growth and fixed mindset beliefs as proposed within Mindset Theory (Dweck, 2006) and other forms of motivation. Specifically, we investigated motivation from either a Self-Determination or Expectancy-Value theoretical lens, as both motivational frameworks offer consistent evidence that more internalized forms of motivation help initiate effort and sustain perseverance. We conducted a series of three-level random-effects meta-analyses including 112 effect sizes from 45 empirical studies and 27,895 participants. Our findings revealed small-to-moderate but robust correlations between mindset beliefs and well-internalized forms of motivation. In particular, while growth mindset beliefs were positively linked to well-internalized forms of motivation, their associations with poorly internalized forms of motivation were found to be non-significant. In contrast, we found negative yet much weaker links between fixed mindset beliefs and well-internalized motivation types (except for the identified group). Among all the poorly internalized motivation types, fixed mindset beliefs are only significantly related to controlled motivation. The results of the current synthesis also highlight the lack of research examining the links between different motivation types and mindset beliefs, particularly fixed mindset beliefs.

Motivation-effort-achievement cycle in learning: a short-range dynamic experiment
Keywords: Achievement, Motivation, Self-concept, Self-efficacy
Presenting Author: TuongVan Vu, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Martijn Meeter, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Abe Hofman, Universiteit van Amsterdam, Netherlands; **Co-Author:**Brenda Jansen, University of Amsterdam, Netherlands; **Co-Author:**Lucía Magis-Weinberg, University of Washington, United States; **Co-Author:**Nienke van Atteveldt, Vrije Universiteit Amsterdam, Netherlands

The present research investigates the reciprocal relations between motivation, effort, and achievement in educational contexts. We employ a short-range dynamic experimental design where participants perform a learning task during which their motivation, effort, and achievement are measured at multiple time points. The first aim is to study the mediating pathway between motivation and achievement by measuring actual effort behaviors. Second, we examine the causality of these relations by experimentally manipulating perceived achievement. Finally, we asked if implicit theory about intelligence (whether one thinks intelligence is malleable) moderates the relationship between motivation and achievement. In the first experiment, we introduced different types of performance feedback (relative to own previous achievements vs. that of peers) which were expected to influence perceived achievement and subsequent motivation. The findings indicate no statistically significant differences in motivation between those who hold different implicit theories of intelligence. In the follow-up experiment, perceived achievement is directly manipulated instead. Halfway in the experiment, participants receive rigged feedback that their achievement has dropped to below peer average. In this innovative design, we also measured the amount of time participants actively view learning materials (i.e. quantitative measure of effort) and also gave them a choice between high-effort vs. low-effort learning materials (i.e. qualitative measure of effort). This second experiment is a registered report where planned analyses and expected (narrative) results are available prior to data collection. Data collection is now finished, and we will be able report the results at the conference.

Session P 19

25 August 2023 18:45 - 20:15
UOM_A04
Single Paper
Cognitive Science, Learning and Instructional Technology, Teaching and Teacher Education

Immersive Technologies for Learning and Social Behaviour

Keywords: Classroom Management, Cognitive Development, Cognitive Skills and Processes, Comprehension of Text and Graphics, Computer-supported Collaborative Learning, Developmental Processes, Educational Technologies, Immersive Technologies for Learning, Pre-service Teachers, Qualitative Methods, Self-regulated Learning and Behaviour, Video-based Learning, Well-being
Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Benedikt Gottschlich, University of Tübingen, Germany

Co-designing for Immersive Learning Experiences in the Classroom

Keywords: Computer-supported Collaborative Learning, Immersive Technologies for Learning, Qualitative Methods, Well-being
Presenting Author: Morgane Domanchin, University of Oslo, Norway; **Co-Author:**Hans Christian Arnseth, University of Oslo, Norway; **Co-Author:**Kenneth Silseth, University of Oslo, Norway; **Co-Author:**Rolf Steier, Oslomet, Norway

This research paper draws on a teacher-led innovation project to create digitally mediated learning experiences targeting the theme of “Health and Wellbeing”. Over a year, high school teachers, students and researchers co-designed three interdisciplinary learning activities involving immersive technologies such as virtual reality (VR) and augmented reality (AR) as well as social media. Each of the three learning activities represents flexible innovative learning ecologies targeting students’ deep learning. By adopting a design-ethnographic approach and social interaction analysis of the development process, the findings provide insight into the designed activities as reflective of broader learning ecologies. In addition, we discuss the potential of immersive technologies to support students’ talk and engagement in small groups. The study documents the development of new teaching and learning practices targeting societal level challenges.

Virtual Reality to support the development of student-teachers’ classroom management skills
Keywords: Classroom Management, Immersive Technologies for Learning, Pre-service Teachers, Video-based Learning
Presenting Author: Wilfried Admiraal, Oslo Metropolitan University, Norway; **Co-Author:**Nadira Saab, Leiden University, Netherlands; **Co-Author:**Deniz Atal, Ankara University, Turkiye; **Co-Author:**Brigitte Theeuwes, ICLON, Leiden University, Netherlands

Virtual reality (VR) technology can support an immersive experience of the classroom context enabling student-teachers to practice their teaching in a variety of different artificial classrooms scenarios within the safe environment of teacher education. Recent research shows that VR technology is effective in noticing classroom problems and forming effective teaching strategies. The objective of the current study is twofold. First, we explore whether 360° video VR technology is an effective tool in improving student-teachers’ classroom management self-efficacy and reducing their stress level. Second, we explore *how* student-teachers notice classroom processes using VR. Two studies have been carried out with pre-service teachers: one mixed-method study focusing on VR improving classroom management self-efficacy and reducing stress levels, and one qualitative study focusing on how VR affects classroom noticing. Findings show that VR helped to lower student-teachers’ stress levels but did not improve their self-efficacy more than just watching videos on screen. Moreover, the combination of watching the classroom events with VR and reflections in small groups supported the development of student-teachers’ noticing skills, i.e. to identify salient events and problematic behavior, to interpret these and think about ways to respond to these. The current studies contribute to our understanding of student-teachers’ process of noticing and how this can be induced by VR technology. It seems that VR with head-mounted displays is more effective in supporting student-teachers’ noticing process compared to watching videos on a screen, and is even more effective when used in combination with reflections in small groups.

Preservice Teachers’ Self-Regulated Learning in Immersive Virtual Environments: A Multimodal Study
Keywords: Educational Technologies, Immersive Technologies for Learning, Pre-service Teachers, Self-regulated Learning and Behaviour
Presenting Author: Engin Ader, Boğaziçi University, Turkiye; **Co-Author:**Alexander Groeschner, Friedrich Schiller University Jena, Germany; **Co-Author:**Tova Michalsky, Bar Ilan University, Israel; **Co-Author:**İpek Paksoy, Boğaziçi University, Faculty of Education, Turkiye; **Co-Author:**Florentine Hickethier, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Mathias Dehne, Friedrich Schiller University Jena, Germany; **Co-Author:**Roger Azevedo, University of Central Florida, United States; **Co-Author:**Zorit Jassin, Bar Ilan University, Israel

This study, conducted by an international group of academics in an EARLI EFG project, is targeting an examination of preservice teachers’ perceptions on their SRL behaviors and VR learning environments while using a VR task. Another aim is to use multimodal data to show how data collected from varying records of performance (such as think aloud, screen recording, birds-eye-view recording) can be linked with preservice teachers’ perceptions manifested by interview data. A triangulation mixed method design was adopted for this study. Participants were 41 preservice teachers from three countries: Germany, Israel and Turkey. Preservice teachers experienced a STEM VR learning task to understand how a virus spreads through everyday activities. While working on the task, participants were instructed to think-aloud and their performance in the VR environment was also captured through separate recordings of the screen and their movements on a bird's eye view camera. Afterwards, participants were interviewed about their perceptions relating to the experience in the VR environment. A coding scheme was developed for analyzing the interview data and three cases from the participants were selected for an investigation of the multimodal data from preservice teachers’ performance during the task. Preliminary findings revealed that evaluation was the most frequently mentioned group of SRL behaviors while planning was mentioned the least, and that the VR environment is an immersive experience which hardly allows participants to mention specific SRL behaviors (e.g. planning) during the task.

Children’s and adults’ spatial representations of a virtual environment.
Keywords: Cognitive Development, Cognitive Skills and Processes, Comprehension of Text and Graphics, Developmental Processes
Presenting Author: Sophie Bénard - Linh Quang, University of Geneva, Switzerland; **Co-Author:**Sandra Berney, University of Geneva, Switzerland; **Co-Author:**Mireille Bétrancourt, University of Geneva, Switzerland; **Co-Author:**Roland Maurer, University of Geneva, Switzerland

The elaboration of mental representations of space is essential for everyday activities, especially when navigating in a new environment. The cognitive processes underlying these representations develop and refine during childhood, but their evolution remains unclear. New technologies such as virtual environments can not only provide insight but also be used to scaffold this development. This study examined spatial representations in 2nd to 4th graders (aged 7-10) and adults (aged 18-60). Spatial representations were assessed through a variety of spatial assessment tasks involving the landmarks recognition, their location, the route taken and distance estimation, after navigating in a virtual city through a guided route. Preliminary analyses of results from primary school students indicate an interaction between gender and school grade on landmark knowledge and relative distance estimation. Girls improved on landmark recognition and location tasks, while boys improved on relative distance estimation tasks. Theoretical and practical implications will be discussed.

Session P 20

25 August 2023 18:45 - 20:15
AUTH_TE2
Single Paper
Assessment and Evaluation, Cognitive Science

Conceptual Change and Knowledge Construction

Keywords: Assessment Methods, Conceptual Change, Knowledge Construction, Meta-analysis, Misconceptions, Quantitative Methods, Science and STEM, Science Education, Secondary Education
Interest group: SIG 03 - Conceptual Change
Chairperson: Janneke stuulen, University Utrecht, Netherlands

Diagnosing and Promoting the Understanding of Chemical Bonding Theory
Keywords: Conceptual Change, Misconceptions, Science Education, Secondary Education
Presenting Author: Adrian Zwyssig, ETH Zurich - Research on Learning and Instruction, Switzerland

Is a salt crystal comprised of molecules? 39% of science undergraduates falsely assume so as they overgeneralize the covalent bonding type. Overgeneralization is a major challenge in science education. Typically, students neglect the differences between the three types of chemical bonds, i.e. covalent, ionic, and metallic bonds. This overgeneralization was confirmed by assessing undergraduates’ knowledge about bonding theory before attending lectures at a Swiss university (N = 1946). This assessment revealed the prevalence of various misconceptions such as the overgeneralization of the model of covalent bonding, as well as uncertainties concerning the differences between chemical bonds and intermolecular forces. Thus, the question arises, how can we promote a better understanding of chemical bonding theory?Comparing and contrasting activities have been proven effective for learners to keep the differences between similar concepts in mind (Alfieri et al., 2013). Therefore, I designed teaching materials (23 lessons) containing multiple comparing and contrasting

activities, introducing the three types of chemical bonds simultaneously. In a pre- and post-test classroom intervention study at Swiss Gymnasiums (N = 326, grade 10) the materials' effectiveness was evaluated. Comparing and contrasting activities fostered students' conceptual understanding more strongly (0.60 < d < 1.05) and were better suited to promote conceptual change than the conventional sequential introduction of the different bonding types. Alfieri, L., Nokes-Malach, T. J., & Schunn, C. D. (2013). Learning Through Case Comparisons: A Meta-Analytic Review. *Educational Psychologist*, *48*(2), 87-113. https://doi.org/10.1080/00461520.2013.775712

The Cronbach's Alphas of Domain-Specific Knowledge Tests Before and After Learning: A Meta-Analysis
Keywords: Conceptual Change, Knowledge Construction, Meta-analysis, Quantitative Methods
Presenting Author: Michael Schneider, University of Trier, Germany; **Co-Author:**Peter Edelsbrunner, ETH Zurich, Switzerland; **Co-Author:**Bianca Simonsmeier, University of Trier, Germany

Cronbach's Alpha is frequently reported in studies on knowledge acquisition and learning. Alpha indicates the internal consistency, i.e., the interrelatedness of the items. Many researchers use fixed cut-off values to evaluate whether a value of Alpha is acceptable. This use of fixed cut-off values is inadequate, in particular, for knowledge tests. Knowledge is a heterogeneous construct. Thus, a low interrelatedness of the items adequately reflects the nature of the assessed construct. Fixed cut-off values are also inadequate because (a) Alpha might be higher after interventions stimulating knowledge integration than before, (b) depends on the number of items in a test, and (c) can differ systematically between subpopulations, e.g., age groups or content domains. To provide more adequate and flexible empirical standards for the Alphas of domain-specific knowledge tests, we conducted a meta-analysis of these indices. We included studies with at least two measurement points. Based on 285 effect sizes from 55 samples, we found that the typical Alpha of domain-specific knowledge tests is α = .847, CI90 [.817; .871]. Alpha was higher after interventions, in tests with more items, tests with open answers, and older age groups. It differed between content domains. The distribution of Alphas showed an underrepresentation of shorter knowledge tests with low Alphas, indicating bias either in the publication record or in test construction. We present guidelines for typical Alphas that researchers can expect for their tests and discuss implications for the theory and assessment of domain-specific knowledge.

Identifying central misconceptions via network analysis
Keywords: Assessment Methods, Knowledge Construction, Misconceptions, Science and STEM
Presenting Author: Christian Thurn, ETH Zurich, Switzerland

A core aspect of successful instruction is to identify and change students' initial misconceptions about a topic. Assessing misconceptions and prior knowledge in physics is often done via concept inventories. These concept inventories are traditionally analyzed by summing up correct answers to infer on students' conceptual knowledge. Yet, for the relational character of conceptual knowledge (e.g., Goldwater & Schalk, 2016), network analysis is more suitable to model the relations of students' answers. When analyzing concept inventories through the lens of network analysis, researchers and educators can gain important insights into students' knowledge structures and identify problematic misconceptions that hinder conceptual change.For this endeavor, I used data about concepts in magnetism. In total, 2210 students from primary and secondary school classes in Switzerland participated in instruction on magnetism in 15 cognitively activating lessons. They completed a concept inventory on magnetism before and after instruction. Following the approach by Brewe et al. (2016), I used network analysis on the distractor answers (the misconceptions) to analyze which misconceptions were central and maybe hindered learning, and which misconceptions persisted after instruction. The results showed that at pretest central misconceptions that related to many other misconceptions were that copper is magnetizable, or related to the shielding of a magnetic field via iron and wood plates. At posttest, central misconceptions were related to the shielding of magnetic fields via aluminum plates and about fair experiments. I will discuss how teachers could use such results to tackle central misconceptions.

Session P 21

25 August 2023 18:45 - 20:15
UOM_A11
Single Paper
Assessment and Evaluation

Critical Comprehension of Text and Graphics

Keywords: Cognitive Skills and Processes, Competencies, Comprehension of Text and Graphics, Conceptual Change, Critical Thinking, E-learning/ Online Learning, Informal Learning, Mathematics/Numeracy
Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Åsa Wengelin, University of Gothenburg, Sweden

Communicating scientific complexity encourages intellectual humility and epistemic trust
Keywords: Cognitive Skills and Processes, Comprehension of Text and Graphics, Critical Thinking, Informal Learning
Presenting Author: Dorothe Kienhues, University of Münster, Germany; **Co-Author:**Nina Vaupotič, University of Vienna, Austria; **Co-Author:**Regina Jucks, WWU Münster, Germany

For socio-scientific issues, such as the complex issue of a sustainable future energy strategy, public's support and understanding is needed. While simplifying science can lead to overconfidence, complexity can be daunting and could hinder action. Therefore, in this preregistered study we were interested in the effects of communicating complexity alongside providing suggestions for concrete actions to be taken. We focused on variables explaining how individuals engage with science-related information: intellectual humility (individual's understanding that their knowledge is limited), source's trustworthiness judgments, and willingness to act. 478 participants (mean age = 30.4, SD = 9.3) took part in a 2 x 2 experimental design study, in which they read a text about a future energy strategy. We manipulated the degree of communicated complexity (reduced vs. not reduced) by explaining how scientific modeling is employed to make predictions about the future energy strategy, and we varied whether concrete actions regarding on how to practically support the transition to sustainable energy were suggested (suggested vs. not suggested). We found that communication of complexity (vs. reduction of complexity) led to higher topic-specific intellectual humility and more trust in the source. Furthermore, when a concrete action was communicated, participants reported lower topic-specific intellectual humility. Participants' willingness to act was neither significantly affected by the way complexity was communicated nor by concrete actions being suggested. Our findings exemplify that individuals can grapple with the complexity and uncertainties of science and that intellectual humility is a virtue that may contribute to productively dealing with knowledge limits.

Do students fall for the easiness effect of science popularization? An intervention study
Keywords: Cognitive Skills and Processes, Comprehension of Text and Graphics, Critical Thinking, E-learning/ Online Learning
Presenting Author: Marc Stadtler, Ruhr-University Bochum, Institute of Educational Science, Germany; **Co-Author:**Lisa Scharrer, University of Frankfurt, Germany; **Co-Author:**Franca Urbisch, Ruhr-University Bochum, Institute of Educational Sciences, Germany

Previous research shows that the easiness by which adult laypeople can understand textual information on a scientific issue seduces them to overlook limitations in their evaluative capabilities, although they usually lack the deep-level knowledge required for fully informed validity judgments. As a result, laypeople tend to more confidently accept easy than difficult scientific information as true (e.g., Kerwer et al., 2021; Scharrer et al., 2012, 2019). This *easiness effect* is especially problematic given that false accounts and conspiracy theories are particularly often characterized by a simplification of complex issues and problems (e.g., Bischof & Senninger, 2018).The present study sought to investigate (1) whether even school students are susceptible to overestimating their evaluative capabilities when encountering easy-to-comprehend scientific information and (2) whether the easiness effect can be mitigated through an instructional video. 104 secondary school students (Grades 10 to 13) read scientific texts that were either easy or difficult to comprehend due to the use/translation of technical terms. Half of the participants watched a short instructional video before their text reading emphasizing the complexity of scientific knowledge and laypeople's resulting dependence on experts.Results showed that after their reading, participants agreed more strongly and confidently with easy than difficult texts. Hence, even secondary school students are susceptible to the easiness effect. The effect was not mitigated when students saw the

instructional video. This shows the robustness of the easiness effect and suggests that more elaborate intervention programs are required to prevent laypeople from being uncritically persuaded by easy misinformation.

Refuting educational myths: Do reading goals make a difference?
Keywords: Cognitive Skills and Processes, Comprehension of Text and Graphics, Conceptual Change, Critical Thinking
Presenting Author: Andreas Lederer, University of Erfurt, Germany; **Co-Author:**Jana Asberger, University of Erfurt, Germany; **Co-Author:**Eva Thomm, University of Erfurt, Germany; **Co-Author:**Johannes Bauer, University of Erfurt, Germany

Refutation texts are a promising approach to refuting misconceptions. They provoke a cognitive conflict by explicitly naming a misconception and correcting it with a scientific explanation. To date, however, there is little evidence on the conditions that influence the efficacy of refutation texts. For example, when presenting preservice teachers a refutation text to combat an educational myth, the instructed reading goal might be of importance because reading goals can affect how readers' processes a text. Therefore, the present study investigated whether the efficacy of a refutation text on an educational myth (the role of hemisphere dominance for learning) depends on reading goals. The preregistered online experiment (N=168 preservice teachers) followed a 2x2x2 mixed design with the between-subject factors text type (refutation vs. traditional) as well as reading goal (explanation vs. entertainment), and the within-subject factor time (before vs. after reading the text). As hypothesized, participants who read a refutation text were more likely to change their belief than participants who read a traditional text. Contrary to our expectations, however, the refutation effect was independent of the reading goal. Our results show that to address misconceptions, refutation texts are more successful than standard texts typically presented in textbooks. However, it is still unclear which conditions foster the efficacy of refutation texts. According to our data, reading goals seem to be less relevant to this.

Critical graph reading: Graphs can mislead adolescents
Keywords: Competencies, Comprehension of Text and Graphics, Critical Thinking, Mathematics/Numeracy
Presenting Author: Kristian Kiili, Tampere University, Finland; **Co-Author:**Jake McMullen, University of Turku, Finland; **Co-Author:**Antero Lindstedt, Tampere University, Finland; **Co-Author:**Tua Nylén, University of Helsinki, Finland; **Co-Author:**Petteri Muukkonen, University of Helsinki, Finland; **Co-Author:**Manuel Ninaus, University of Graz, Austria

One of the main challenges of our times is the spread of misinformation and disinformation on the Internet. Manipulation of graphs is one powerful way that has been used to persuade and mislead people. We investigated how adolescents (N = 404) can read and interpret well-constructed and misleading bar graphs. A misleading graph is based on valid data, but the visual appearance of the graph has been manipulated to distort the message of the graph. The results indicated that most students knew how to read a single data point from a graph. However, students' graph interpretation skills (inferring relationships in the represented data) varied considerably. We performed latent profile analysis (LPA) and identified five profiles, which differed in students' abilities to interpret well-constructed and misleading graphs, and their risk of being misled with visual manipulations. The students of the best performing profile (Critical graph readers; 17%) could consistently interpret well-constructed and misleading graphs correctly. The weakest performing group (17%) had considerable difficulties in graph interpretation, suggesting an overall lack of understanding of how to interpret graphs. Importantly, the students of the largest profile (Misleadable graph readers; 35%) could interpret well-constructed graphs but were misled by visual manipulations leading to faulty interpretations. We assume that these readers neglected the numerical information of the graph and based their interpretation only on the visual aspects of the graph, i.e., the height of the bars. There is a clear need to develop interventions to help students build resistance against common graph manipulation techniques.

Session P 22

25 August 2023 18:45 - 20:15
UOM_R09
Single Paper
Cognitive Science, Teaching and Teacher Education

Music Education

Keywords: Art Education, Cognitive Skills and Processes, Curriculum Development, Early Childhood Education, Learning Approaches, Meta-analysis, Primary Education, Quantitative Methods, Social Sciences and Humanities, Synergies between Learning / Teaching and Research, Teaching/Instructional Strategies
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education
Chairperson: Genevieve Allaire-Duquette, Université de Sherbrooke, Canada

Evidence-based Music Teaching: a Systematic Review and a Meta-Analysis
Keywords: Art Education, Meta-analysis, Synergies between Learning / Teaching and Research, Teaching/Instructional Strategies
Presenting Author: Daniela - Georgiana Valache (Voinescu), West University of Timisoara, Romania; **Co-Author:**Marian Ilie, West University of Timisoara, Romania

In this paper, we aim to investigate the impact of music teaching activities (MTAs) on musical-artistic outcomes, intending to contribute to what evidence-based teaching means in the field. We started with a broad search with a result of 93,291 articles from querying online search engines. After carefully applying the inclusion criteria and extracting information using the coding scheme, we included only 20 articles in the effect size calculation. The results indicate an overall medium and heterogeneous effect size of MTAs (d = .722, SE = .126, Z = 5.240, p < .001, k = 26; $Q_{(20)}$ = 114.971, p

Music Training Produces Near but not Far Transfer of Learning in School-age Children
Keywords: Cognitive Skills and Processes, Primary Education, Quantitative Methods, Social Sciences and Humanities
Presenting Author: Leonor Neves, University Institute of Lisbon (ISCTE-IUL), Portugal; **Co-Author:**Marta Martins, University Institute of Lisbon (ISCTE-IUL), Portugal; **Co-Author:**Ana Isabel Correia, University Institute of Lisbon (ISCTE-IUL), Portugal; **Co-Author:**São Luís Castro, University of Porto - Portugal, Portugal; **Co-Author:**César Lima, University Institute of Lisbon (ISCTE-IUL), Portugal

There is a growing interest in potential transfer of learning from music training to non-musical cognitive domains. Because most studies on this topic have focussed on transfer from music to language and domain-general abilities (e.g., IQ), whether music training affects socio-emotional abilities remains poorly explored. Moreover, recent studies suggest that, while transfer across closely related domains (near transfer) might exist, transfer between substantially different domains (far transfer) is rare or non-existent. We conducted a longitudinal training study with 7-year-old second graders (N = 110; 54 girls, M_{age} = 7.01 years, SD = 0.46), and examined near and far transfer effects of music training. The study was implemented in a regular school environment, and included pre-test, training and post-test phases, in three conditions: music (experimental condition), sports (active control condition), and no training (passive control condition). The training programs were conducted over two school years and lasted for approximately 13 months (ca. 111 hours). The measures of near transfer included auditory skills, fine-motor skills, and gross-motor skills, and the measures of far transfer included emotion recognition and voices and faces, and higher-order socio-emotional skills. We examined longitudinal effects of training by using mixed-effects modelling. Compared to the control groups, musically trained children improved significantly more on auditory and motor skills (near-transfer), but not on emotion recognition or higher-order socio-emotional skills (far-transfer). These findings inform debates on the use of music as an intervention tool in educational and clinical settings and have implications for models on music-related behavioral plasticity.

Music and Music Integration in Preschool Programs: A Scoping Review
Keywords: Art Education, Curriculum Development, Early Childhood Education, Learning Approaches
Presenting Author: Ana Rodrigues de Lemos, Faculty of Psychology and Educational Sciences of the University of Porto, Portugal; **Co-Author:**Teresa Leal, University of Porto, Portugal; **Co-Author:**Diana Alves, Centre for Psychology at University of Porto, Portugal; **Co-Author:**Isabel M.P. Abreu-Lima, University of Porto, Portugal

Music plus music integration is a framework based on the arts education movement. It constitutes an approach that puts the music at the center of the curricula,

valuing both the authentic and comprehensive study of music and the contribution of music concepts, skills, and processes for teaching and learning in other domains (Scripp & Gilbert, 2016). The positive relationship between music training and cognitive, social-emotional abilities, and academic achievement strengthens the value of this framework (e.g., Schellenberg, 2004, 2006). Documented initiatives based on this framework include mainly projects and programs directed at elementary and upper levels (Burnaford et al., 2007; Scripp et al., 2014). Therefore, the present scoping review aims to map the extent, variety, and characteristics of preschool programs relying on music skill development along with music as a means to enhance other competencies. The review includes data-based search, as well as gray literature, to ensure a comprehensive coverage of the topic. Preferred Reporting Items for Systematic Reviews and Meta-Analysis – Extension for Scoping Reviews (PRISMA-ScR) were followed. From the database search, 526 references were stored in the *Mendeley* software and screened for title and abstract assessment, based on the pre-defined eligibility criteria. Two independent reviewers conducted the screening process and disagreements were solved through discussion with an additional reviewer. 435 records were excluded and 91 followed to the full-text assessment. After data extraction and screening of the reference lists, gray literature will be searched, and further results will be discussed in this presentation.

Teaching Crows and Nightingales to Sing: Exploring Vocal Abilities in Primary School Music Education
Keywords: Art Education, Cognitive Skills and Processes, Curriculum Development, Primary Education
Presenting Author: Zyxcban Wolfs, Open University of the Netherlands, Netherlands; **Co-Author:**Els Boshuizen, Open University of the Netherlands, Netherlands; **Co-Author:**Saskia Brand-Gruwel, Open University of the Netherlands, Netherlands

As music curriculums in primary school vary widely, so do musical abilities of primary school children. Existing literature reports large differences in vocal abilities in children of the same age. Consequently, music teachers face challenges to teach various difficulty levels in one classroom. More empirical knowledge about how musical abilities are associated with other characteristics of children and their learning environment might improve the structure and content of primary school music curriculums. We explored associations between vocal abilities (singing accuracy, melodic achievement, and rhythmic performance), perception of musical features (pitch, tonality, timing, timbre, and loudness), and cognitive levels (math, grammar, reading accuracy and comprehension) among children aged 6 to 12 ($N = 233$). We investigated whether age, gender, cognitive levels, school type, music perception abilities, and music training) predicted vocal abilities, and whether these vocal abilities differed by age. All vocal abilities were predicted by music perception abilities. Singing accuracy was predicted by gender but not by age. Math level was negatively associated with singing accuracy and melodic achievement, while rhythmic performance was not. Rhythmic performance was the only vocal ability predicted by formal musical training. Gender plays a role in singing accuracy; on average girls outperform boys. Age is positively associated with melodic achievement and rhythmic performance. However, regardless of children's age, differences in singing and rhythmic abilities were large. Music teachers should pay attention to singing accuracy, melodic achievement, and rhythmic performance by expanding children's usable vocal register, enhancing their musical cognition, and improving their psychomotor skills.

Session P 23

25 August 2023 18:45 - 20:15
UOM_R03
Poster Presentation
Learning and Social Interaction, Learning and Special Education, Teaching and Teacher Education

Teachers' Self-Efficacy

Keywords: Anxiety and Stress, Attitudes and Beliefs, Educational Technologies, Gifted and Talented Students, In-service Teachers, Informal Learning, Motivation, Primary Education, Resilience, Science Education, Self-efficacy, Teacher Efficacy, Teacher Professional Development, Well-being
Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education, SIG 15 - Special Educational Needs
Chairperson: Frank Hellmich, Paderborn University, Germany

Teachers' self-efficacy and attitudes towards gifted and talented education
Keywords: Attitudes and Beliefs, Gifted and Talented Students, In-service Teachers, Self-efficacy
Presenting Author: Lucía Barrenetxea-Mínguez, University of Deusto, Spain

Teachers' self-efficacy and attitudes towards gifted and talented education influence the quality of the instructional intervention directed to the needs of such students. Therefore, studying how teachers perceive their ability towards gifted education and assessing their beliefs will provide useful information when planning teacher training in this area. With such rationale, our study aims to investigate teachers' self-efficacy and attitudes towards gifted and talented education. In total, 546 teachers filled out the "Teacher self-efficacy in the educational response to gifted and talented students" and the "Educational attitudes toward gifted and talented education" questionnaires, which were previously validated. A set of 11 additional variables were studied as possible moderators: sex, age, teaching experience, type of school, location of the school, previous experience working with gifted students, previous training on gifted education, type of training, type of enrolment in the training (i.e., voluntary), closeness to gifted people (e.g., family, friends), and self-perception as a gifted person. Descriptive and analysis of variance (ANOVAs) were performed. Results indicated self-efficacy is low among the teachers and should be improved; additionally, teachers generally reported favourable attitudes towards gifted and talented education. These results have practical implications for the improvement of future teacher development programs in the area of gifted and talented education.

Teachers' Use of Informal Learning Opportunities in Germany
Keywords: In-service Teachers, Informal Learning, Self-efficacy, Teacher Professional Development
Presenting Author: Sebastian Röhl, University of Tubingen, Germany; **Co-Author:**Jana Groß Ophoff, University College of Teacher Education Vorarlberg, Austria; **Co-Author:**Colin Cramer, University of Tübingen, Tübingen School of Education, Germany

The professional work as a school teacher requires continuing professionalization throughout the whole career. In addition to participation in in-service training and professional development courses, this process also includes the use of informal learning opportunities which exist outside of organized events in everyday professional life, and which are mostly initiated by the teachers themselves. This study focuses on the field of continuing professional development of teachers, which has hardly been investigated so far. Based on a quantitative questionnaire survey of a representative sample of $N = 405$ teachers from Germany, we applied structural equation models to analyze the factorial structure and the use of informal learning opportunities, as well as their personal and school-related determinants. The findings indicate predictive effects of teachers' demographic and dispositional characteristics (age, gender, lack of traditional qualification, self-efficacy), but also of job characteristics (extended area of responsibility) on the use of informal learning opportunities. Furthermore, indications pointed to the necessity of differentiating print and online media regarding reception behavior. The role of informal learning opportunities in the context of the teachers' overall professionalization is discussed.

Resilience, Self-Compassion and Self-Efficacy in Reducing Special Education Teachers Technostress
Keywords: Anxiety and Stress, Educational Technologies, Resilience, Teacher Efficacy
Presenting Author: Pierpaolo Limone, University of Foggia, Italy; **Co-Author:**Giusi Antonia Toto, University of Foggia, Italy; **Co-Author:**Benedetta Ragni, University of Foggia, Italy

Special education teachers face significant stress during work delivery and care provision of students with special needs, and this increased with COVID-19 pandemic, having to adapt to new methods of teaching and technologies, such as Information and Communication Technology (ICT) tools. While factors that could influence technostress have been investigated, relatively few studies explored how to reduce teachers' technostress effectively. Identifying these variables could support teachers' professional development and reduce their technostress. The main aim of the current study was to analyze the role of ICTs self-efficacy, resilience, and self-compassion in reducing ICTs technostress in a sample of special needs teachers. 629 Italian special needs teachers (89% female) aged from 22 to 60 ($M = 39.00$; $SD = 8.00$) were enrolled and completed online *The Self-Compassion Scale*, *The Brief Resilience Scale*, and a tool to evaluate different dimensions related to the use of ICTs by teachers (Dong et al., 2020; ICTs Self-efficacy and ICTs Technostress subscales were used). Preliminary Pearson's bivariate correlations among the studied variable were performed with SPSS v.27. Overall, teachers' technostress (R2=0.46, p=.000) resulted

negatively associated with teachers' ICTs self-efficacy, resilience, and self-compassion. These results can usefully inform training programs aimed at reducing technostress through the improvement of not only teachers' level of ICTs literacy but also their level of confidence in using the technology. The research implications of our study also concern the identification of resilience and self-compassion as protective factors that may change teachers' stress processing.

Motivational determinants of early-career teachers' work engagement
Keywords: In-service Teachers, Motivation, Teacher Professional Development, Well-being
Presenting Author: Dora Petrović, Institute for Social Research in Zagreb, Croatia; **Co-Author:**Iris Marušić, Institute for Social Research, Croatia; **Co-Author:**Jelena Matić, Institute for Social Research - Zagreb, Croatia, Croatia

Research on teacher motivation points to the importance of different motivational characteristics in explaining the professional development of teachers and the quality of teaching, as well as desired academic outcomes for their students. The initial motivation for choosing the teaching profession was associated with plans related to professional engagement and career development at the beginning of teachers' professional career. In addition, research on teacher motivation suggests that teacher goal orientations, through coping mechanisms, relate to indicators of teacher well-being such as job engagement and burnout. The aim of this study is to examine the role of the initial teacher motivation and goals for teaching in the work engagement of teachers at the beginning of their professional career. The study was carried out on 118 teachers with up to 5 years of teaching experience. Hierarchical regression analysis with motivation for the teaching profession and goal orientations for teaching as predictor variables was carried out for the overall work engagement of teachers and its four components. The results indicate that teachers with different motivational profiles in their early years of teaching report different levels of emotional, cognitive and social work engagement. This evidence could inform differentiated support for early career teachers' professional development to promote their work engagement as an important aspect of professional well-being.

Experiences fostering self-efficacy in teaching science among in-service elementary school teachers
Keywords: In-service Teachers, Primary Education, Science Education, Self-efficacy
Presenting Author: Estelle Desjarlais, Université du Québec à Montréal, Canada; **Co-Author:**Pierre Chastenay, Université du Québec à Montréal (UQAM), Canada; **Co-Author:**Jean-Philippe Ayotte-Beaudet, Université de Sherbrooke, Canada

Elementary school plays a crucial role in science education (Hasni & Potvin, 2015). In contrast, teachers' sense of science teaching self-efficacy (the belief in their ability to succeed at a task (Bandura, 2003)) is particularly low for this subject (Sandholtz & Ringstaff, 2014). This presentation aims to explore the relationship between elementary school teachers and science teaching. More precisely, we aimed to further understand personal and professional experiences fostering a sense of self-efficacy in science teaching among female elementary teachers. We conducted qualitative interpretive research with seven female teachers whose sense of self-efficacy (as measured by a questionnaire) had significantly improved since the beginning of their careers. Results suggest that in-service training plays a vital role in developing self-efficacy in science teaching. The full results of this project will be discussed in this paper. This work aims to contribute to a better understanding of the long-term development of a sense of self-efficacy in elementary school science teaching, which has been studied mainly among pre-service students. In particular, they will allow the identification of effective interventions and resources for professional development.

Session P 24

25 August 2023 18:45 - 20:15
UOM_R04
Poster Presentation
Higher Education, Motivational, Social and Affective Processes, Teaching and Teacher Education

Teaching Approaches, Emotion, Motivation and Attitudes

Keywords: Educational Technologies, Emotion and Affect, Feedback, Higher Education, Learning Strategies, Motivation, Multimedia Learning, Self-regulated Learning and Behaviour, Teacher Professional Development, Teaching Approaches, Teaching/Instructional Strategies, Well-being
Interest group: SIG 08 - Motivation and Emotion, SIG 10 - Social Interaction in Learning and Instruction
Chairperson: Annette Busse, University of Kassel, Institute of Educational Science, Germany

Enjoyment is Reciprocally Transmitted Between Teachers and Students
Keywords: Educational Technologies, Emotion and Affect, Higher Education, Multimedia Learning
Presenting Author: Muhterem Dindar, Tampere University, Finland; **Co-Author:**Anne Christiane Frenzel, Ludwig-Maximilians-Universität München, Germany; **Co-Author:**Reinhard Pekrun, University of Essex, United Kingdom; **Co-Author:**Corinna Reck, Ludwig-Maximilians-Universität München, Germany; **Co-Author:**Anton Marx, Ludwig-Maximilians-Universität, Germany

The critical importance of positive emotions for classroom functioning is well established, but their social dynamic during instruction is poorly understood. This study provides evidence of facial joy mimicry between teachers and students in real-life instruction. Data include video-recorded interactions of 13 university instructors and 69 of their students, analyzed on a frame-by-frame basis (80,000 frames per video). Participants' joy expressions were captured through a multi-camera setup and submitted to AI-based automated facial emotion coding. Facial mimicry within each teacher–student dyad was determined through cross-recurrence quantification analysis. Results showed that students' facial expressions of joy co-occurred substantially above chance level -2s and +3s seconds relative to the teachers' expressions. Post-session self-reported joy was significantly positively correlated the teacher–student dyad mimicry quantity for teachers. These findings imply that enjoyment transmission between teachers and students is reciprocal process, and that teachers emotionally benefit from their students' joy mimicry.

Student Perception of Empathy and Teacher Professional Development: A Model for Identity Exploration
Keywords: Emotion and Affect, Feedback, Motivation, Teacher Professional Development
Presenting Author: Joseph Eisman, Temple University, United States; **Co-Author:**Jeff Vomund, George Mason University, United States

We suggest a novel approach to teacher empathic development through identity-based professional development, which aims to support identity exploration and improve student outcomes. We argue that the recently developed Student Perceptions of Teacher Empathy Scale (SPTES), which measures students' perceptions of teacher empathy, can support identity exploration. Paralleling other teacher empathy and instruction literature, the SPTES is specifically organized around students' perceived teacher empathy through their instructional, organizational, interpersonal interactions in the classroom. We suggest two avenues for identity-based professional development using SPTES: (a) teachers may review their classroom data and plan strategies to continue practices that students experience as empathetic; (b) teachers might review the items of the SPTES and reflect upon potential interactions and strategies that may increase students' perceptions of empathy. In both cases, this operationalization of teacher empathy can promote teacher empathetic identity through reflection on student experience and perspective

Instructional strategies as a moderator between self-regulated learning and academic achievement
Keywords: Learning Strategies, Motivation, Self-regulated Learning and Behaviour, Teaching Approaches
Presenting Author: Yuichiro Sato, Keio University, Japan; **Co-Author:**Yuno Shimizu, Hyogo University of Teacher Education, Japan; **Co-Author:**Takashi Fukutomi, Minami Kyushu University, Japan

This study examined the effects of teachers' instructional strategies on the relationship between students' self-regulated learning processes and academic achievement. Multi-level structural equation modelling was conducted using a questionnaire administered to elementary school teachers (N = 84) and their students (N = 2665) in Japan's 5th and 6th grades. The results showed that the constructive strategy was positively related to academic achievement, while the transmissive strategy was negatively related to academic achievement. Additionally, the transmissive strategy had a positive moderating effect on the relationship between elaboration and academic achievement and a negative on the relationship between planning and academic achievement. In the student model, intrinsic, identified and external regulation was positively related to most learning strategies. In addition, identified regulation, effort regulation, elaboration

and planning were positively related to academic achievement, while help-seeking was negatively related to academic achievement. These findings have two implications for educational research and practices. First, using a transmissive strategy is a double-edged sword that strengthens and weakens the positive relationship between learning strategies and academic achievement. Second, teachers' instruction that encourages students to develop and deepen their ideas effectively improves academic achievement across many cultures.

Teachers' attitudes towards their responsibility and perceived use of motivational factors
Keywords: Higher Education, Motivation, Teaching Approaches, Teaching/Instructional Strategies
Presenting Author: Asta B Schram, University of Iceland, Iceland; **Co-Author:**Abigail Snook, University of Iceland, Iceland

Our study objective was to investigate our university teachers´ attitudes towards and perceived use of five factors that have been found to motivate students in the course environment. We were also interested in comparing these attitudes and perceived use across Schools. A survey was sent to tenured/sessional teachers´ email addresses (n=2087) that were obtained from HR. We received 555 responses (27% response rate). We used a 6-point Likert agreement scale to assess teachers´ attitudes towards and recent use of the five *MUSIC Model*^{SM} *of Motivation* components (eMpowerment, Usefulness, Success, Interest, Caring). We combined "strongly agree" and "agree" in the following percentages for attitudes and perceived use of the concepts, respectively, obtaining M (64%; 52%), U (90%; 77%), S (76%; 72%), I (95%; 78%), C (96%; 88%) Faculty seemed to place less value on and use fewer autonomy strategies, such as giving students some choices (M). The success component (S) was also lower, both regarding attitude and use. The other three components, especially the caring component, were highly valued and used. However, when the data results were split to focus on each school at the university, there were some distinct and significant differences between them. Specifically, the teachers at the School of Education and the School of Humanities valued and used autonomy strategies more than teachers in the School of Health Sciences and School of Engineering and Natural Sciences. We suggest that faculty development staff increase their efforts to work with faculty on motivational strategies, especially the importance of student eMpowerment.

Feeling Good while Motivating Students: The Role of Teaching Identity and Motivation to Teach
Keywords: Motivation, Teacher Professional Development, Teaching Approaches, Well-being
Presenting Author: Branko Vermote, Ghent University, Belgium; **Co-Author:**Maarten Vansteenkiste, Ghent University, Belgium; **Co-Author:**Bart Soenens, Ghent University, Belgium; **Co-Author:**Wim Beyers, Ghent University, Belgium

Teachers' motivation to teach serves as a critical resource, predicting professional well-being and intentions to drop-out (Fernet et al., 2016), and their teaching behavior (Aelterman et al., 2019). Although many novice teachers are motivated to teach when entering the profession, the challenge is to preserve one's motivation throughout the years. Presumably, the roots of teachers' sustainable motivation can be traced back to their professional identity development. In the present study, we considered teachers' professional identity as a precursor of their motivation to teach, their professional well-being, and their (de)motivating teaching style, with motivation to teach mediating between teaching identity and the outcomes. The results obtained in a cross-sectional sample of 324 secondary teachers (M_{age} = 37.97, *SD* = 11.95, 66% female) and 333 higher education teachers (M_{age} = 44.24, *SD* = 9.89, 82.5% female) showed first that both secondary and higher education teachers with a well explored and firmly anchored teaching identity reported more good quality (i.e., autonomous) motivation to teach, experienced more professional well-being and used more motivating and less demotivating teaching strategies in the classroom. The opposite was observed for teachers ruminating about their teaching identity. Motivation to teach partially mediated the relationship between teaching identity and diverse outcomes, with teaching identity also being directly related to teacher outcomes. Overall, the findings underscore the importance of teaching motivation and identity in predicting teachers' personal and interpersonal functioning.

Autonomy Support Begins with Understanding: Empathy and Students' Basic Psychological Needs
Keywords: Emotion and Affect, Motivation, Teaching Approaches, Teaching/Instructional Strategies
Presenting Author: Jeff Vomund, George Mason University, United States; **Co-Author:**Angela Miller, George Mason University, United States

As a part of Self-determination Theory (SDT), Ryan and Deci (2020) suggest that understanding the perspective of students is critical to autonomy supportive instruction. Understanding another's perspective is a common definition of cognitive empathy (Murphy & Lilienfeld, 2019). As such, SDT would seem to suggest that instructors' cognitive empathy would predict the autonomy support satisfaction of students. To empirically test this hypothesis, our research used structural equation modeling to examine the relationships between students' perceptions of instructor cognitive and affective empathy and the satisfaction and frustration of their basic psychological needs (BPNSF; Chen et al., 2015). Results show cognitive empathy predicts BPNSF, and autonomy support satisfaction. Affective empathy positively predicts relatedness support frustration. This study highlights the importance of instructor cognitive empathy for needs supportive teaching and the complex role of affective empathy in classroom settings.

Session P 25

25 August 2023 18:45 - 20:15
UOM_R01
Poster Presentation
Assessment and Evaluation, Higher Education, Learning and Instructional Technology, Learning and Social Interaction

Learning Analytics

Keywords: Artificial Intelligence, Assessment Methods, Classroom Assessment, Computer-assisted Learning, Computer-supported Collaborative Learning, Conceptual Change, Cooperative/Collaborative Learning, E-learning/ Online Learning, Educational Policy, Higher Education, Learning Analytics, Learning Strategies, Problem-based Learning, Qualitative Methods, Quantitative Methods, Self-regulated Learning and Behaviour, Vocational Education and Apprenticeship Training
Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education, SIG 09 - Phenomenography and Variation Theory, SIG 27 - Online Measures of Learning Processes
Chairperson: Carolin Hahnel, Germany

Predictive modeling of problem-solving behavior in an office simulation to identify weak students
Keywords: Computer-assisted Learning, Learning Analytics, Problem-based Learning, Vocational Education and Apprenticeship Training
Presenting Author: Sabrina Ludwig, University of Mannheim, Germany; **Co-Author:**Andreas Rausch, University of Mannheim, Germany; **Co-Author:**Viola Deutscher, University of Mannheim, Germany; **Co-Author:**Jürgen Seifried, University of Mannheim, Germany

Fostering learner's problem-solving competences requires an understanding of the cognitive problem-solving process in a simulation. Researchers increasingly show interest in predictive modeling in simulations with recorded learner behaviour data (stored as time-stamped log files) to be able to provide early adaptive instructional support. Therefore, the present study investigates the problem-solving processes of 197 vocational education and training (VET) students in a computer-based office simulation developed for valid learning and assessment in VET. After completing an onboarding scenario to become familiar with the open-ended office simulations, the participants worked on a comprehensive scenario that included a supplier selection based on manifold information and various calculations. This study follows a two-stage approach for (RQ1) identifying n-gram features from process data and (RQ2) predicting students' problem-solving success with machine learning models. Regarding RQ1, the n-gram analysis revealed that groups with different levels of problem-solving success differ in their problem-solving behavior. High-performing students opened relevant documents and calculated in the relevant spreadsheet table, while low-performing students rather opened irrelevant documents and used the reference book for additional information. Regarding RQ2, random forest showed an acceptable accuracy of .69, which is comparable with model performances of similar research studies. Machine learning models are therefore helpful to identify weak students early. Limitations of the research design and implications from the view of instructional support and simulation development will be discussed.

A step forward: How stakeholders envision overcoming learning analytics' current challenges?

Keywords: Educational Policy, Higher Education, Learning Analytics, Qualitative Methods
Presenting Author: Anceli Kaveri, University of Oulu, Finland; **Co-Author:**Hanni Muukkonen, University of Oulu, Finland

Learning analytics (LA) focuses on interdisciplinary research and development of data-based solutions and dashboards. In higher education context persistent challenges of LA relate to resources and institutional strategies. In this study, stakeholders of LA in one higher education institution gathered to discuss their perceptions on these issues. Problem and solution tree (PAST) workshops were conducted for 16 participants. The data includes transcribed discussion and notes written by participants. The stakeholders described the resource, strategic and technical inhibitors of LA. They suggested better communication related to LA development and implementation strategies as well as better data and tool integrability. The results call for better strategic and practical integration between LA stakeholders and the institutional and national level decision-making related to LA development to take the next step in developing LA for improved studying, teaching, guiding and decision-making in higher education context.

University Students Experience Learning as View-Turns
Keywords: Conceptual Change, Higher Education, Learning Analytics, Learning Strategies
Presenting Author: Kristina Ahlberg, University of Gothenburg, Sweden, Sweden

University Students Experience Learning as View- Turns Kristina Ahlberg Gothenburg University, Sweden Phenomenography as educational research approach is based on a definition of learning as changing one's way of seeing, experiencing, understanding something (Marton,1986). The purpose of this study was to examine: Do University Students experience learning as Changing Way of Seeing Something, View-Turns (Hermodsson, 1976)? If so - Can they describe the processes and what constitutes them? A narrative method, with an open-ended and dual-focussed question to students of Medicine, Nursing, Occupational Therapy and Physiotherapy in their final term, was used to obtain narratives of students' experiences of learning as View-Turns. The difficulty, pointed out by Husserl (1907/1995), regarding knowledge formation on one's own consciousness, is in this study successfully overcome by an open-ended and double-focussed interview question. The result reveals that all students, except one, described an experienced process of learning as a View-Turn. The narratives were analysed according to Phenomenography and two qualitatively different main categories were discerned: Addition of Something New, with subcategories Information and Result, and Restructuring of Awareness, with subcategories Figure/Ground, Difference/Similarity, Perspective and Whole/Part. An interesting secondary finding was a significant difference between the two main categories in accounts by students of Medicine and by students of Nursing, Occupational Therapy and Physiotherapy. Medical students' accounts were categorised predominantly as Addition of Something New, whilst accounts from Nursing, Occupational Therapy and Physiotherapy students were categorised almost exclusively as Restructuring of Awareness.

Students' physiological arousal and synchrony in the presence of a manipulated cognitive challenge
Keywords: Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Learning Analytics, Self-regulated Learning and Behaviour
Presenting Author: Joni Lämsä, University of Oulu, Finland; **Co-Author:**Andy (Khanh Xuan) Nguyen, University of Oulu, Finland; **Co-Author:**Márta Sobocinski, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland

Successful self-regulated learning (SRL) and socially shared regulation of learning (SSRL) in collaborative learning settings can be a challenging task for learners. SRL and SSRL are not something that happens throughout the learning process; instead, within the learning process, there can be cognitive challenges, for example, that trigger the need for regulation. To support students in strategic regulation of oneself and the group collectively when they face these challenges, we need ways to detect those challenging events. There is empirical evidence that increasing physiological arousal and synchrony among collaborating students is temporally coupled with the challenges in collaborative learning. In this study, we investigated whether the physiological arousal and synchrony were associated with presenting a manipulated cognitive challenge during collaborative learning. Eleven small groups of three high school students (N = 33) worked with a collaborative learning task for 30-40 minutes. After the first half of the learning task, the manipulated cognitive challenge was presented to them. To study the physiological arousal and synchrony before and after the manipulated cognitive challenge, we detected the peaks of skin conductance responses (SCR) and investigated whether the SCR peaks occurred simultaneously among the collaborating students. We found groups with significantly more SCR peaks and moments of physiological synchrony after the manipulated cognitive challenge than before the challenge. In our presentation, we will draw from the findings of the contextual data (such as self-reports) to interpret (the lack of) students' physiological responses to the manipulated cognitive challenge.

Statistically Gauging Vital Subcomponents of Diagrammatic Competency
Keywords: Assessment Methods, Classroom Assessment, Learning Analytics, Quantitative Methods
Presenting Author: Shun Saso, The University of Tokyo, Japan; **Co-Author:**Yuri Uesaka, The University of Tokyo, Japan

Owing to the emerging importance of developing students' ability to utilize diagrams, there is a growing demand among schoolteachers to quantitatively assess the extent to which students have mastered the elements of diagram utilization. To address this need, previous studies have utilized a class of latent variable models called the Cognitive Diagnostic Models (CDMs), which can elucidate students' latent diagrammatic competency statuses; however, it does not consider the crucial subcomponents of diagrammatic competency (ability to interpret given diagrams, to image diagrams, and to use diagrams spontaneously, etc.). Therefore, this study aims to incorporate diagrammatic competency and its subcomponents into the analysis of CDMs to obtain useful information regarding what elements students are, or are not, acquiring. Using data from responses to a mathematical task to measure diagramming competency, statistical evidence shows that while more than 90% of students can interpret given diagrams, only a small number of students can use diagrams spontaneously.

Student summaries as performance predictors in online learning settings using NLP
Keywords: Artificial Intelligence, Assessment Methods, E-learning/ Online Learning, Learning Analytics
Presenting Author: Ilias Karasavvidis, University of Thessaly, Greece; **Co-Author:**Vasiliki Ragazou, University of Thessally, Greece; **Co-Author:**Charalampos Papadimas, University of Thessaly, Greece

While students produce a bulk of texts in E-learning environments (e.g. forum discussions), the potential of such texts for predicting student performance has been largely unexplored. The literature review indicated that only a handful of studies have employed Natural Language Processing (NLP) techniques for analyzing texts that students produce in various online settings. This study introduces a novel NLP-based approach that utilizes student-generated texts for predicting performance after viewing video lectures. One hundred and twelve student teachers participated in the study. The students were asked to view a series of six short video lectures and then write a brief summary for each one. The performance on each video lecture was measured using knowledge tests that comprised ten close-ended questions. This performance was subsequently split into low and high respectively using the median as a threshold. Five feature sets were extracted from the summaries and were used to train eight common Machine Learning (ML) algorithms. The objective was to test the classification accuracy using different combinations of feature sets and ML algorithms. The results indicated that the raw text feature set achieved higher average classification accuracy in two video lectures, while the engineered text feature set achieved higher average classification accuracy in two other video lectures. On the other hand, the ML algorithms that led to high average classification accuracy were boosting algorithms. Overall, the study findings suggest that student-generated texts are a very promising feature for predicting student performance when learning from video lectures.

Session P 26

25 August 2023 18:45 - 20:15
UOM_R02
Poster Presentation
Higher Education, Learning and Instructional Technology, Learning and Special Education, Motivational, Social and Affective Processes

Learning and Developmental Disabilities

Keywords: Assessment Methods, At-risk Students, Cognitive Skills and Processes, Communities of Learners and/or Practice, Emotion and Affect, Engagement, Eye Tracking, Higher Education, Inclusive Education, Learning and Developmental Disabilities, Primary Education, Qualitative Methods, Quantitative Methods, Self-regulated Learning and Behaviour, Synergies between Learning / Teaching and Research
Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education, SIG 15 - Special Educational Needs, SIG 27 - Online Measures of Learning

Processes
Chairperson: Thomas Martens, Medical School Hamburg, Germany

Participative autism research: reaching social validity through the participatory research index
Keywords: Communities of Learners and/or Practice, Engagement, Learning and Developmental Disabilities, Synergies between Learning / Teaching and Research
Presenting Author: Katerina Dounavi, Queen's University Belfast, United Kingdom

Behavioural research has resulted in a wealth of evidence of effectiveness for educational interventions supporting people with autism spectrum disorders, especially when these are applied early in life. However, an important gap exists in the social validation of such interventions, resulting in recent critiques of applied behaviour analytic research and practice as a whole and more importantly in a reduced uptake of such interventions by the community.In the present paper, the fundamental principles of participatory research will be presented as the theoretical underpinning of a democratic approach that involves key stakeholders throughout the research process. A discussion of where behaviour analytic research for autism stands in terms of achieving social validity will be provided, based on a systematic review of the literature. Following this, the participatory research index will be introduced together with guidelines on how its use can enhance educational research practices that will result in increased impact on the lives of children on the autism spectrum, their family members, researchers, practitioners and the wider community.

Experiences with individual accommodation for students with dyslexia perceived needs in HE
Keywords: At-risk Students, Higher Education, Learning and Developmental Disabilities, Qualitative Methods
Presenting Author: Liv Håberg, Volda University College, Norway; **Co-Author:**beate farstad, Volda University College, Norway

This study's main aim is to enlighten how 6 students in higher education with the diagnosis dyslexia experience the access and quality of information on the institution's homepages. There are 32 homepages investigated in the sample, and it is the students experience with accommodation investigated, according to the students' perceived needs. There is a lot of research done and ongoing con young students, and less research so far is describing the HE- students with dyslexia. The student mass is increasing and students who apply for individual accommodation might increase with the search masses for their studies. The study is ongoing autumn 2022 through data collection from the homepages and individual qualitative interviews with the students. The analysis is based on an abductive approach through coding according to incremental deductive inductive strategy. The preliminary findings indicate a variety of individual accommodation offers, and students needs is not always met satisfactorily according to the Equality and Anti-discrimination Act. This variety in accommodation and experience might contribute to differences in offers depending on the institutions chosen. With this study discussions about equality will be relevant, discussing if this might be a threat to equality.

German Adaption and Psychometric Properties of the CERQ-kids
Keywords: Assessment Methods, Emotion and Affect, Primary Education, Quantitative Methods
Presenting Author: Taina Marisa Gabriel, Leibniz Universität Hannover, Germany; **Co-Author:**Moritz Börnert-Ringleb, Leibniz University Hannover, Germany

Emotion regulation has increasingly been in the focus of research across different disciplines. In educational contexts, previous studies describe an association of student's emotion regulation skills and dependent relevant constructs such as school performance, social inclusion and social behaviour of students. There is evidence that students start to learn to cognitively regulate their emotions as early as in primary school, which underlines the potential necessity of gaining insights into cognitive emotion regulation skills in younger children. At the same time, appropriate measures to address emotion regulation in young children are lacking. E.g., up to today, there is no measure available to assess the cognitive emotion regulation of children below the age of 12 in German. Hence, the goal of the study is to translate and adapt the Cognitive Emotion Regulation Questionnaire kids (CERQ-kids) into German. The CERQ-kids is a questionnaire that aims to gain insights into cognitive emotion regulation of students between the ages 9-11. It comprises 36 items associated with nine emotion regulation strategies (e.g. acceptance, rumination, self-blame). In our analysis, in a first step, we tried to replicate the original factor structure of the CERQ-kids. The results of the confirmatory factor analysis (N=255) indicated an adequate model fit. Some items showed poor factor loadings. In a second step, we examined the psychometric properties of shortened version of the CERQ -kids (27 items). This analysis further supported the validity of this short version.

ID-READ: Individual Differences in Reading Comprehension with Eye-tracking in AD(H)D and Dyslexia
Keywords: Cognitive Skills and Processes, Eye Tracking, Learning and Developmental Disabilities, Self-regulated Learning and Behaviour
Presenting Author: Ellen Kok, Utrecht University, Netherlands; **Co-Author:**Carolien A. N. Knoop-van Campen, Radboud University Nijmegen, Netherlands; **Co-Author:**Eliane Segers, Behavioural Science Institute, Radboud University Nijmegen, Netherlands

Learners with AD(H)D and dyslexia may experience reading comprehension difficulties. Their reduced attention span and/or decoding problems may not only directly impact comprehension, but also lead to not using the right strategies during reading. Indeed, an important aspect of reading comprehension is the ability to use appropriate reading strategies. A distinction can be made between selective reading and intensive reading. Since reading is a covert process and difficult to measure with self-reports, webcam-based eye-tracking can be used to objectively and accessible identify reading strategies. For future applications of such data in education, a better understanding is needed of which reading strategies can be distinguished with webcam-based eye-tracking, how these strategies relate to individual variation, and their relation with reading comprehension outcomes. Therefore, ID-READ focuses on three research questions: 1) To what extent can webcam-based eye-tracking be used to distinguish between selective and intensive reading strategies in primary school children? 2) To what extent does the reading process (strategies) mediate between individual variation (decoding, language skills, and attention) and reading comprehension outcomes? 3) To what extent does this differ for children with dyslexia and/or AD(H)D compared to typically developing children? In Spring 2023, 300 primary school children (grades 5 and 6) will participate in ID-READ. During the poster presentation, the first results will be presented and opportunities and challenges of using webcam-based eye-tracking in reading comprehension education will be discussed.

Speech intelligibility: A latent variable approach on utterances' transcriptions
Keywords: Assessment Methods, Inclusive Education, Learning and Developmental Disabilities, Quantitative Methods
Presenting Author: Jose Manuel Rivera Espejo, University of Antwerp, Belgium; **Co-Author:**Sven De Maeyer, Antwerp University, Belgium; **Co-Author:**Steven Gillis, Antwerp University, Belgium

Intelligibility is defined as "the extent to which a speaker's message is understood by the listener" [15]. Its attainment carries an important societal value, as it is a milestone in language development [4]. For its measurement, orthographic transcriptions of utterances are used to construct an entropy score, which express the degree of (dis)agreement in such transcriptions [2,22]. However, although the benefits of using transcriptions to (indirectly) quantify intelligibility are clear [1,2,7], the statistical procedures used to model such data are not as sophisticated as the measurement procedures.
Consequently, we propose a novel data analysis using a Bayesian implementation of the Generalized Linear Latent and Mixed Model (GLLAMM) [17,18,19,20,23]. The statistical procedure offers four benefits. First, it allows to model the bounded entropy data. Second, it 'constructs' a speaker's latent intelligibility scale. Third, it test our research hypothesis at the appropriate level. And fourth, it avoids 'manufacturing' false confidence in the parameter estimates, producing correct statistical inferences [11].
As a result we find that, not modeling the bounded nature of the data could lead us to an overestimation of the parameter estimates' precision. For our hypothesis, we see that HI/CI children with genetic etiology have similar levels of intelligibility as NH kids, at 'hearing ages' of five. However, children with other etiologies have a significantly lower levels of intelligibility, at same ages. Moreover, we find that NH children develop their intelligibility with each year of 'hearing age' at a higher rate than HI/CI kids, contrary to what was previously found [2].

Session P 27

25 August 2023 18:45 - 20:15
UOM_A06
Workshop

Learning and Instructional Technology

Teaching sequences on spatial orientation using a virtual city on computer in grades 2-4 in Geneva

Keywords: Computer-assisted Learning, Educational Technologies, Learning Strategies, Teaching/Instructional Strategies
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Please bring your own device to attend and participate in this workshop.
Our research bears on the teaching and learning of spatial orientation in Primary schools in Geneva, in Grades 2 to 4. We will present this context and the way we have come to develop a virtual city on computer specifically conceived (see ICT Demonstration in this EARLI conference presented by Fatou Maty Diouf) to support a didactical engineering of about 8 teaching sequences for each of the three grades. We have experimented these sequences in 5 classes (around 100 students) over 3 years
The aim of the workshop is to present the essential elements of the didactical sequences we build, focusing on a few activities that we will present to the workshop participants. We will also share some of the results obtained in our experimentations, and confront some of our analyses to the participants' reaction to their own experience during the workshop.

Teaching sequences on spatial orientation using a virtual city on computer in grades 2-4 in Geneva
Presenting Author: Sabrina Matri, University of Geneva, Switzerland; **Co-Author:**Jean-Luc Dorier, University of Geneva, Switzerland; **Co-Author:**Fatou-Maty Diouf, University of Geneva, Switzerland

Please bring your own device to attend and participate in this workshop.
Our research bears on the teaching and learning of spatial orientation in Primary schools in Geneva, in Grades 2 to 4. We will present this context and the way we have come to develop a virtual city on computer specifically conceived (see ICT Demonstration in this EARLI conference presented by Fatou Maty Diouf) to support a didactical engineering of about 8 teaching sequences for each of the three grades. We have experimented these sequences in 5 classes (around 100 students) over 3 years
The aim of the workshop is to present the essential elements of the didactical sequences we build, focusing on a few activities that we will present to the workshop participants. We will also share some of the results obtained in our experimentations, and confront some of our analyses to the participants' reaction to their own experience during the workshop.

Session P 28

25 August 2023 18:45 - 20:15
UOM_A10
ICT Demonstration
Instructional Design

Supporting teachers in designing (digital) teaching and learning with myScripting

Keywords: Educational Technologies, Higher Education, Instructional Design, Teacher Professional Development
Interest group: SIG 04 - Higher Education

Please bring your own device if you are attending this ICT demonstration.The trend toward digital learning is unbroken. During the Corona crisis, numerous face-to-face courses were transformed into blended learning and eLearning courses. The conception of didactically meaningful digital learning is a demanding process. Course designers face many challenges. Does the course have a balanced ratio of content transfer to activation or interaction? Does the planned workload correspond to the credit points? Is the formative and summative learning assessment appropriate? How can proven teaching strategies be integrated? And last but not least, they are faced with the question of which technical possibilities the selected LMS actually offers for the implementation of their concept. This is exactly where myScripting comes in. The online tool guides course creators step by step through the educational design process. The goal is to create a storyboard that can be used both as a rough overview and for further detailed planning, and from which a prototype in a LMS can even be created at the touch of a button. In this way, myScripting supports the design of context-specific, diverse digital learning environments. Additionally, the collaborative functions of sharing and commenting on educational design support the development and teaching of lessons in teams as well as in-depth reflection on educational design. In this demonstration, the functionality and possible pedagogical uses of myScripting will be explained and participants are guided to develop educational storyboards themselves. Additionally, possible ways of using myScripting in the teacher training will be discussed as well as initial results concerning educational design research are presented.

Supporting teachers in designing (digital) teaching and learning with myScripting
Presenting Author: Claude Müller, Zurich University of Applied Sciences, Switzerland; **Co-Author:**Jennifer Erlemann, ZHAW School of Management and Law, Switzerland

Please bring your own device if you are attending this ICT demonstration.The trend toward digital learning is unbroken. During the Corona crisis, numerous face-to-face courses were transformed into blended learning and eLearning courses. The conception of didactically meaningful digital learning is a demanding process. Course designers face many challenges. Does the course have a balanced ratio of content transfer to activation or interaction? Does the planned workload correspond to the credit points? Is the formative and summative learning assessment appropriate? How can proven teaching strategies be integrated? And last but not least, they are faced with the question of which technical possibilities the selected LMS actually offers for the implementation of their concept. This is exactly where myScripting comes in. The online tool guides course creators step by step through the educational design process. The goal is to create a storyboard that can be used both as a rough overview and for further detailed planning, and from which a prototype in a LMS can even be created at the touch of a button. In this way, myScripting supports the design of context-specific, diverse digital learning environments. Additionally, the collaborative functions of sharing and commenting on educational design support the development and teaching of lessons in teams as well as in-depth reflection on educational design. In this demonstration, the functionality and possible pedagogical uses of myScripting will be explained and participants are guided to develop educational storyboards themselves. Additionally, possible ways of using myScripting in the teacher training will be discussed as well as initial results concerning educational design research are presented.

Session Q 1

26 August 2023 08:00 - 09:30
AUTH_CH
Invited Symposium
Motivational, Social and Affective Processes

The Potential of Biophysiology for Understanding Motivation, Engagement, and Learning

Keywords: Achievement, Anxiety and Stress, Cooperative/Collaborative Learning, Emotion and Affect, Feedback, Higher Education, Mathematics/Numeracy, Motivation, Primary Education, Social Interaction
Interest group:
Chairperson: Tim Mainhard, Leiden University, Netherlands
Discussant: Reinhard Pekrun, University of Essex, United Kingdom

Integrative models of human learning and performance emphasize the joint operation of biological, psychological, social, and educational processes to fully understand human functioning. Educational researchers have typically emphasized psycho-educational and psycho-social factors in motivation, engagement and learning, but do not often consider the biophysiological factors. This invited symposium showcases recent educational research that included

biophysiological measures and methods on cooperation in primary school students, the relation between stress and task persistence of early math learners, the role of challenge and threat in secondary level science testing, as well as the effects of immediate feedback when working with Adaptive Learning Technologies in higher education. Next to the presenting empirical findings, this symposium reflects on how the inclusion of biophysiological measures can provide a more rigorous basis for effective educational theory, research, and practice.

Cooperation in primary school children: Exploring cardiac vagal tone and cognitive control
Presenting Author: Benedetta Zagni, University of Padua - Italy, Italy; **Co-Author:**Libera Ylenia Mastromatteo, University of Padua, Italy; **Co-Author:**Sara Scrimin, University of Padova, Italy

Cooperating is important in the classroom, where pupils are required to interact in a positive pro-social way. Yet, what determines children's engagement in cooperation is still debated. Individual characteristics and cognitive skills may play a crucial role. Specifically, cardiac vagal tone (CVT), an index of physiological self-regulation and environmental adjustment, has been linked with pro-social acts. Proactive cognitive control, the ability to actively maintain contextual information in directing behaviors, is less studied in relation to pro-sociality, yet is particularly important in the classroom and may influence cooperation. This study aims to investigate the role of physiological self-regulation (indexed by CVT) and cognitive control (proactive and reactive) on the likelihood of cooperation.

A total of 109 primary school students (1^{st}-5^{th} grades) were enrolled (44 males) in the study. Children's heart rate was registered at rest and CVT was computed as an index of physiological self-regulation. An AX-Continuous Performance Task (AX-CPT) was used to assess cognitive control, as indexed by Proactive Behavioral Index (PBI) error rates. Last, cooperative behavior was assessed through a modification of a stag hunt game. Logistic linear regression revealed that overall children who favored reactive cognitive control engaged more in cooperation and that a moderated CVT favored cooperation. The interaction between CVT, PBI, and cooperation revealed that moderate physiological self-regulation is required to increase the probability of cooperation among children using proactive cognitive control. These results underline the importance of fostering both self-regulation skills, especially among students favoring proactive control to increase cooperative behaviors in class.

The effect of physiological stress on young students' achievement behaviour and learning
Presenting Author: Anna-Liisa Jõgi, Tallinn University, Estonia; **Co-Author:**Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

It is proposed that some physiological stress is important for both social-emotional functioning and cognitive performance. Our aim was to study the effect of physiological stress on students' achievement behaviours, like task-persistence, and gain in math skills during the first school year. 277 Grade 1 students participated in the study. Salivary cortisol was used as an indicator of physiological stress. Latent variable formed by three day-time cortisol samples was used in the structural equation model. Task persistence was rated by class teachers. Math skills were tested at the beginning of the school year and in Spring of Grade 1, and were used as a latent change score in the model. Our results showed that students with higher physiological stress were typically more persistent and their math skills improved more during the first school year. Students may need some physiological stress as arousal for staying focused on their studies and develop their academic skills. However, more research is needed on this topic, especially for testing the sources of students' stress.

Students' Psychological Orientations to Science Tests: An Educational and Bio Psychological Study
Presenting Author: Andrew Martin, University of New South Wales, Australia; **Co-Author:**Roger Kennet, The University of New South Wales, Australia; **Co-Author:**Emma Burns, University of New South Wales, Australia; **Co-Author:**Rebecca Collie, University of New South Wales, Australia; **Co-Author:**Joel Pearson, The University of New South Wales, Australia

A student's appraisal of science tests, and associated psychological challenge and threat states, impact their experience and performance on these tests. The present investigation of 244 high school science students sought to identify salient psychological orientations to science tests that may provide insights into how to optimize students' experience of and outcomes in science. It did so by augmenting "traditional" psycho-educational challenge and threat measures with relatively novel physio-psychological and neuro-psychological measures. Latent profile analysis (LPA) was conducted using five psychological indicators: psycho-educational indicators of challenge and threat (via self-reports of self-efficacy and anxiety, respectively), neuro-psychological indicators of internal attention (via electroencephalogram-alpha, EEG-alpha) and working memory activity (via EEG-theta), and a physio-psychological indicator of sympathetic arousal (via electrodermal activity, EDA)—as shown in Figure 1. LPA revealed four profiles representing distinct groups of high school students' psychological orientations to science tests: *Confident Striders, Confident Battlers, Ambivalents,* and *Fearers*. Each of these profiles had distinct associations with students' test enjoyment and achievement. Findings provide important insights into the extent to which inclusion of bio-psychology indicators, alongside educational psychology indicators, contributes to our understanding of students' challenge-threat orientations to science.

University Students' Emotional Responses to Immediate Feedback in Adaptive Learning Technologies
Presenting Author: Anne Horvers, Radboud University Nijmegen, Netherlands; **Co-Author:**Tibor Bosse, Radboud University, Netherlands; **Co-Author:**Ard Lazonder, Radboud University, Netherlands; **Co-Author:**Inge Molenaar, Radboud University, Netherlands

Emotions can have a major impact on students' learning performance. In particular, after students get feedback on their task execution, different emotional responses to this feedback can be triggered. Negative emotions, such as frustration, can impede learning, and positive emotions, such as enjoyment, can enhance learning. As empirical evidence for these relationships during learning with Adaptive Learning Technologies (ALTs) is limited, this study investigated university students' emotional responses to the immediate feedback these ALTs provide. Students' physiological, experiential and behavioural responses were measured. More specifically, their arousal was continuously measured by electrodermal activity (EDA) (physiological) and their self-reported valence (experiential) and observations of emotion types via facial expressions (behavioural) were recorded after every step in the solution process. The results showed that there were more peaks in EDA after immediate feedback than would be expected based on chance. Contrary to our expectations, feedback on failure (FOF) did not elicit stronger physiological responses than feedback on success (FOS). Students' experiential responses showed significantly more negative valence after FOF and positive valence after FOS. Behavioural observations showed significantly more negative emotion types after FOF and more positive emotion types after FOS. This study is the first step in assessing emotions through multimodal data streams and designing ALTs that take students' emotions into account.

Session Q 2

26 August 2023 08:00 - 09:30
UOM_CR
Symposium
Culture, Morality, Religion and Education

Ecology of family-school partnership within socio-economically and ethnically diverse contexts

Keywords: Attitudes and Beliefs, Cultural Diversity in School, Early Childhood Education, In-service Teachers, Migrant / Refugee and Minority students, Parental Involvement in Learning, Parents' Beliefs and Affect, Primary Education
Interest group: SIG 05 - Learning and Development in Early Childhood
Chairperson: Alexandra Karousou, Democritus University of Thrace, Greece
Organiser: Pauline Slot, Utrecht University, Netherlands
Organiser: Efthymia Penderi, Democritus University of Thrace, Greece
Discussant: Paul Leseman, Utrecht University, Netherlands

Children's "educational niche" is a theory-driven model describing the multidimensional and multilevel nature of family-school partnership in relation to diverse ecological factors. It gives emphasis to the role of culture in shaping parents' and teachers' behaviors and relationships. Culturally responsive relationships take into account sociocultural, linguistic and ethnic disparities to promote trust, rapport and collaboration between parents and teachers, as a means to tackle

inequalities and conflictual interactions to promote all children's school success. This is a priority for the European educational agenda, especially due to the major influx of migrants and refugees in the last few years. Three cross-national studies highlight ethnically diverse parents' and teachers' relationships, according to their personal experience with regard to children's ECEC and primary education, in eight European countries. The first study concerns 487 parents with a Turkish or Maghreb migration background in three European countries, while in the other two studies involved 449 early childhood and primary school teachers from six European countries reported on dimensions of family-school partnerships and a number of demographic and personal factors. Covering aspects of all the three components of the niche, results helped to explain some of the contradictory relevant findings reported in the literature by examining the way different macro and micro characteristics and micro and meso processes influence relationship building between socio-economically and ethnically diverse parents and teachers. Cross-country, within group and between ECEC and primary education differences are discussed, providing insights for relevant research, educational policy, transition processes and professional development programs.

Young children's "educational niche": Family-school partnership and culture responsive relationships
Presenting Author: Efthymia Penderi, Democritus University of Thrace, Greece

Although family-school partnership has been identified as one of ECEC quality indicators, there is a gap regarding a theory-based model to describe its multidimensional and multilevel nature, shaped by contextual factors. Combining Bronfenbrenner's bio-ecological theory and Super and Harkness "developmental niche" young children's "educational niche" is proposed to elaborate on the way parents and teachers' interact to promote children's school success, filtering ecological influences. The model gives emphasis on the role of culture in shaping parents and teachers' behaviors and relationships. Culture responsive relationships take into account sociocultural, linguistic and ethnic disparities to promote trust, rapport and collaboration as a means to tackle inequalities and conflictual interactions, so as to promote all children's learning, according to the sociopedagogical role of education. The need to develop culturally sensitive attitudes and practices towards people with different values and beliefs, is a high priority in the European educational agenda due to the major influx of migrants and refugees in the last few years. This is particularly important during the early years, when children and families transition to (pre)school, taking into account that the way parents engage in their child's education and interact with teachers, sets the stage for their later involvement and acknowledgment of their role.

Turkish and Maghreb parents' relations with ECEC teachers: Role of family and (country) context
Presenting Author: Ryanne Francot, University Utrecht, Netherlands; **Co-Author:**Katharina Ereky-Stevens, University of Oxford, United Kingdom; **Co-Author:**Martine Broekhuizen, Utrecht University, Netherlands; **Co-Author:**Hande Erdem-Möbius, Otto-Friedrich-Universität Bamberg, Germany; **Co-Author:**Paul Leseman, Utrecht University, Netherlands

Immigrant parents may encounter certain barriers when trying to establish a trustful relationship with teachers at Early Childhood Education and Care (ECEC) centers, although this can be related to a complex interplay of factors at various levels. The current study examined the differences in parents' relationship with teachers across immigrant groups and countries, and its associations with family, context and country characteristics, for parents with a Turkish or Maghreb immigrant background, living in Germany, France, and the Netherlands ($N = 487$). Multigroup regression analyses showed that across countries and groups, immigrant parents are in general positive regarding their personal relationship with the teacher. The direct associations with demographic characteristics were limited. Personal and cultural characteristics, such as parents' self-efficacy, acculturation attitudes and language proficiency in the national language, were found to be related to the parent-teacher relationship, though differences were found between the immigrant groups and between countries. The findings are discussed in the light of national educational and integration policies in a culturally diverse Europe.

Teacher-parent relationship in ECE and primary education. A Cross-National Study in Six Countries
Presenting Author: Valentina Pagani, Università di Milano Bicocca, Italy; **Co-Author:**Pauline Slot, Utrecht University, Netherlands; **Co-Author:**Efthymia Penderi, Democritus University of Thrace, Greece; **Co-Author:**Helga Norheim, Faculty of Humanities, Sports and Educational Science, Norway; **Co-Author:**Olga Wysłowska, Faculty of Education, University of Warsaw, Poland; **Co-Author:**Krzysztof Bulkowski, University of Warsaw, Poland

Positive teacher-parent relationships act as a protective factor for all children but especially for those most exposed to the risk of academic failure (i.e., pupils with an immigrant background and/or coming from low-income families), favouring children's well-being and successful school functioning. Despite the importance of family-school partnerships throughout the children's (pre)school career, the nature of this relationship changes across grades as a reflection of distinctly different histories and cultures of the two institutions, which ultimately result in different understandings, expectations, values, and teaching practices. The present paper, gathering data from six European countries (i.e., England, Greece, Italy, the Netherlands, Norway, and Poland), explores the nature of teachers' relationship with low SES and ethnic minority parents focusing on the differences between ECEC and primary education. 449 early childhood and primary school teachers completed an online survey with questions on their background, their culturally sensitive classroom practices and classroom diversity, and their relationship with parents. Results show that early childhood teachers tend to report comparatively more positive and less negative relations with parents compared to schoolteachers. Implications for improving the teacher-parent relationship on the part of the teacher, especially in the primary school context, will be discussed.

What aspects contribute to parent-professional relationships in a diverse (pre)school context?
Presenting Author: Pauline Slot, Utrecht University, Netherlands; **Co-Author:**Efthymia Penderi, Democritus University of Thrace, Greece; **Co-Author:**Helga Norheim, Faculty of Humanities, Sports and Educational Science, Norway; **Co-Author:**Valentina Pagani, Università di Milano Bicocca, Italy; **Co-Author:**Olga Wysłowska, Faculty of Education, University of Warsaw, Poland; **Co-Author:**Krzysztof Bulkowski, University of Warsaw, Poland

Teacher-parent relationships are important for children's well-being and school functioning, especially for children with an immigrant and/or low socioeconomic status (SES) background who are at risk of academic failure. This study examined positive and negative attributes of this relationship and possible determinants (i.e., teachers' educational level, work experience, diversity-related self-efficacy, adoption of culturally sensitive classroom practices and (pre)school diversity) among 449 early childhood and primary school teachers across six European countries with varying educational and inclusive policies (i.e., England, Greece, Italy, the Netherlands, Norway, and Poland). Teacher-parent relations encompassed four interrelated, but distinct aspects: *shared beliefs with parents*, *reciprocity*, *hierarchy*, and *problem-related contact*. Differential country patterns were visible that could, partly, reflect national policies or curricula. Despite these differences, the adoption of culturally sensitive classroom practices showed consistent associations with teacher-parent relations. Teachers who were more culturally responsive in their classroom showed more shared beliefs and reciprocity in the relation with parents and less hierarchy and problem-oriented contact. This supports the notion of 'culturally responsive partnerships' as specifically important when working with diverse parents. Implications for improving practice concern a stronger focus on developing intercultural competences in pre- and in-service education.

Session Q 3

26 August 2023 08:00 - 09:30
AUTH_T002
Symposium
Motivational, Social and Affective Processes

The Interplay of Motivation, Emotion, and Self-Regulation in Diverse Populations

Keywords: Achievement, Emotion and Affect, Engagement, Metacognition, Motivation, Self-efficacy, Self-regulated Learning and Behaviour, Social Aspects of Learning and Teaching, Synergies between Learning / Teaching and Research, Teaching/Instructional Strategies
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Adar Ben-Eliyahu, University of Haifa, Faculty of Education, Israel
Chairperson: Lihi Sarfaty, University of Haifa, Faculty of Education, Israel
Discussant: Matthew Bernacki, United States

The role of emotion and motivation have been a subject of increased inquiry in the context of self-regulated learning (SRL) frameworks. Taking an integrative

approach and providing a lens from different models of SRL, the symposium seeks to create a shared language among different models and researchers. The symposium will present four studies that show the role that motivation and emotion play as they interact with other processes and influence SRL. Paper 1 highlights how motivation shapes emotion and subsequent intentions for engagement. Profiles of achievement emotions for White and Black American students are presented and analyzed in terms of the associations of science motivation with emotion and persistence. Paper 2 presents how motivation shapes students' self-evaluation – a critical component of SRL in post-secondary students. Paper 3 examined the association of metaprocesses (spanning cognition, emotion, and behavior) and SRL using latent profile analyses. The findings of this study emphasize that different groups of students may have different metaprocesses which are associated with different SRL strategies and perceived teacher achievement orientation. Paper 4 examines the interplay between teacher and student SRL using a complex dynamic systems approach. The findings show the affective, complex, dynamic, situated, and socially essence of teachers' self-regulation of their pedagogical practices. Taken together, these papers provide a range of methods and approaches to considering the interplay of motivation and emotions, self-perceptions, and self-regulation in different population of secondary and post-secondary students and teacher. Discussion will focus on modeling dynamic and interactive relationships within SRL.

Relations Among College Science Students' Motivation, Belonging, Emotions, and Intentions to Persist
Presenting Author: Arianna White-Levatich, Old Dominion University, United States; **Co-Author:**Anthony Perez, Old Dominion University, United States; **Co-Author:**Lisa Linnenbrink-Garcia, Michigan State University, United States

Framed within the Control Value Theory of Achievement Emotions (Pekrun & Perry, 2014), we investigated how students' appraisals of control, value, and belongingness related to the development of emotion profiles in an undergraduate science context. We evaluated how emotion profiles arose within the two largest racial/ethnic groups enrolled in the course – i.e., within a sub-sample of Black students and a sub-sample of white students – in an effort to challenge deficit perspectives and highlight unique results within groups. Five emotion profiles were identified in each demographic sample; appraisals of control, value, and belongingness significantly predicted likely profile membership, which was in turn associated with students' commitment to science. These results have significance for instructors and researchers who aim to foster inclusive, supportive environments, and to bolster students' success in STEM.

Students' Use of Self-Testing in STEM Programs: Interindividual Differences in Test Engagement
Presenting Author: Fani Lauermann, University of Bonn, Germany; **Co-Author:**Daria Katharina Benden, University of Bonn, Germany; **Co-Author:**Jeffrey DeVries, TU Dortmund University, Germany

Students' math ability and study skills are critical for their academic success in math-intensive study programs in science, technology, engineering, and mathematics (STEM). Thus, intervention efforts to increase students' participation and retention in these fields often target their math knowledge and study skills, for instance, via diagnostic self-tests. Self-tests are a critical self-regulation tool because they inform students' ability self-evaluations (i.e., metacognitive knowledge) and allow students to monitor their learning progress. However, students' subject-specific motivation and quality of engagement during self-testing are important prerequisites for the effectiveness of this learning strategy. Using data from an ongoing large-scale project, which was conducted with beginning postsecondary students enrolled in STEM fields (N = 3,217; 33% female), this study examined students' level of motivation and test engagement while taking a comprehensive and freely available digital math self-test provided by the state ministry of education. Drawing on expectancy-value theory, we explore interindividual differences in students' math-related motivations and test engagement in terms of their subjective evaluations of the tested math content (e.g., perceived relevance and self-reported engagement), test persistence (e.g., the proportion of seen but unanswered questions), and test performance. The analyses identify characteristics of students who are most likely to engage with the self-test and thus benefit from this type of intervention. The findings underscore the importance of considering differences in subject-specific and test-taking motivation in analyses of self-regulated learning behaviors such as self-testing.

Metaprocesses and Self-Regulated Learning Among High School Students: A Latent-Profile Approach
Presenting Author: Alla Hemi, Bar Ilan University, Israel; **Co-Author:**Adar Ben-Eliyahu, University of Haifa, Faculty of Education, Israel; **Co-Author:**Amit Meitar-Doron, University of Haifa, Faculty of Education, Israel; **Co-Author:**Kiril Shelachevitch, University of Haifa, Faculty of Education, Israel; **Co-Author:**Lihi Sarfaty, University of Haifa, Faculty of Education, Israel

Students that have knowledge (i.e., metacognition) on how to learn have been shown to have higher achievements. Using a broad lens to conceptualize metaprocesses, we investigated how metacognition, metaemotion and metabehavior combine with emotional, cognitive and behavioral self-regulated learning (SRL) for different groups of high school students using latent profile analyses. Participants consisted of Israeli high school students (N = 1025, 51% female, M_{age} = 16.53) who completed questionnaires assessing their metacognition, metaemotion and metabehavior, cognitive, behavioral, and emotional SRL, rehearsal, organization, elaboration, and perceptions of teacher achievement orientations. Seven metaprocesses-SRL profiles were identified which were associated with students' use of learning strategies and perceived teachers' achievement orientation. Profiles of students with lower levels of metaprocesses and most forms of SRL were associated with lower levels of cognitive strategy use as well as perceiving the teacher as low on mastery achievement orientation. Profiles with higher scores on indicators of metaprocesses and SRL were associated with higher levels of cognitive strategy use and perceiving the teacher as high on mastery achievement orientation. Interestingly, metaemotion seemed to be less associated with cognitive use outcomes than metacognition and metabehavior. The findings highlight that knowledge about learning may differ among groups of high school students, and that this knowledge is associated with on-task SRL strategy use.

A Complex Dynamic Systems Perspective on Teacher Self-Regulation of Instructional Practice
Presenting Author: Joseph Eisman, Temple University, United States; **Co-Author:**Avi Kaplan, Temple University, United States; **Co-Author:**Lightning Jay, University of Pennsylvania, United States; **Co-Author:**Abby Reisman, University of Pennsylvania, United States; **Co-Author:**Timothy Patterson, Temple University, United States; **Co-Author:**Wendy Chan, University of Pennsylvania, United States; **Co-Author:**Jenni Conrad, Temple University, United States

Teacher self-regulation of their instructional actions has received little scholarly attention. We note the dearth of research that goes beyond aggregated patterns of relations between constructs to explain teachers' situated self-regulation of their practice. In the current study, we use a complex dynamic systems approach to conceptualize the self-regulation undergirding the emergence of moment-by-moment teacher actions in particular classroom contexts. We investigate this self-regulation through an observation of a teacher's actions while she facilitates a discussion in a high school history classroom. The results highlight the cultural, complex, dynamic, situated, and socially-oriented nature of the cognitive, motivational, and emotional processes that undergirds the teacher's self-regulation of her unfolding decisions about specific instructional moves. The teacher's inferred appraisals, goals, self-perceptions, and consequent self-regulated actions shifted within particular activity systems within the lesson, in response to contextual factors, and through the social dynamics with the students

Session Q 4

26 August 2023 08:00 - 09:30
AUTH_DC1
Symposium
Cognitive Science

COGNITIVE PROCESSES IN CRITICAL READING

Keywords: Argumentation, Attitudes and Beliefs, Cognitive Skills and Processes, Comprehension of Text and Graphics, Critical Thinking, Eye Tracking, Reading, Reasoning, Self-regulated Learning and Behaviour, Writing/Literacy
Interest group: SIG 02 - Comprehension of Text and Graphics
Chairperson: Alexandra List, United States
Organiser: Patricia Alexander, University of Maryland, United States
Discussant: Alexandra List, United States

Literacy research over the last quarter century has called for a broadening of our conceptions of reading, from a strictly decoding and comprehension process, to a process requiring students to critically evaluate texts, as a part of democratic citizenship (Garcia et al., 2021; Leu et al., 2004). Aligned with this view of reading as a critical process have been efforts to examine students' source and content evaluation online, when learning from multiple texts (Breakstone et al., 2021; Brodsky et al., 2021; Pérez et al., 2018). Papers in this symposium adopt varied lenses on critical reading. These include examining students' evaluations of source, determinations of evidence quality, identifications of narrative themes and marginalizing language in texts, and, even, students' regulatory self-assessments when completing a reading-to-write task. Unifying these papers is a focus on specifying the cognitive processes underlying critical reading. Methods employed include eye-tracking, think-alouds, surveys of strategy use, and key-logging. Based on the richness of the processing data collected, and their analysis, authors in this symposium are able to not only define the cognitive processes involved in critical reading, but also to suggest conditions under which critical reading is most likely occur. Authors' specification of the processes and conditions facilitating critical reading will be used as a basis for suggesting approaches to instruction and intervention as well as for recommending directions for future work.

COMPREHENSION AND EVALUATION: ARGUMENT TYPE, BELIEF CONSISTENCY AND READING GOALS

Presenting Author: Sylvia Maria Savvidou, University of Cyprus, Cyprus; **Co-Author:**Irene Anna Diakidoy, University of Cyprus, Cyprus; **Co-Author:**Lucia Mason, University of Padova, Italy

The present study examined the influence of argument type (science-based vs personal case-based), belief consistency, and reading goals (read to evaluate vs read to learn) in the comprehension and trustworthiness evaluations of multiple texts. Undergraduate students read four claim-conflicting texts about vegan nutrition that varied in terms of their argument type and completed single text comprehension and trustworthiness rating tasks before answering a question that asked them to list all the pro vs con arguments presented across all texts. Results showed that personal case-based texts that capitalized on real-life experiences were better comprehended (single and multiple text level) than science-based texts that relied on scientific evidence to support their claim. Nevertheless, reading with the goal to evaluate increased memory representation for the belief inconsistent texts at the multiple text level and lower trustworthiness ratings, overall. More importantly, an evaluation reading goal resulted in higher trustworthiness evaluations of the higher argument-quality science-based texts in comparison to the lower argument-quality personal case-based texts. The present study highlights the conditions that facilitate the influence of content-related factors, such as argument quality, in single and multiple text comprehension and trustworthiness evaluations.

THE RELATIONSHIPS AMONG VISUAL BEHAVIOR, MULTIPLE-TEXT PROCESSING STRATEGY USE AND TASK OUTCOMES

Presenting Author: An-Hsuan Wu, National Taiwan Normal University, Taiwan; **Co-Author:**Meng-Jung Tsai, National Taiwan Normal University, Taiwan

This study aims to explore the relationships among learners' visual behavior, multiple-text strategy use, and task outcomes (information integration, sourcing, and decision-making tendency). A total of sixty participants read multiple documents regarding Chinese and Western medical treatments. The reading process of each participant was recorded via an eye tracker. After the reading task, two self-report scales were administered to evaluate students' multiple text-processing strategies and medical decision-making tendencies. The task outcome consisted of information integration and sourcing, and were scored according to scoring frameworks. *Pearson*'s correlation analysis and hierarchical regression analysis were used to explore the relationships among visual attention distributions, multiple-text processing strategies, medical decision-making tendencies, and task outcomes. The results revealed that *the revisited fixation duration (RFD)* on Western medical treatment information significantly and negatively predicted multiple-text strategy use. Moreover, *the total fixation duration (TFD)* on the Western medical treatment information significantly and positively predicted the participants' information integration outcomes, while the RFD on the source information significantly and positively predicted sourcing outcomes. Furthermore, the TFD on the Western medical treatment information and the RFD on the background information served as the predictor of medical decision-making tendencies. The results indicated that learners' visual attention during a multiple-document reading task could reflect their multiple-text strategy use and could affect their task outcome regarding information integration, sourcing, and medical decision-making tendencies.

CRITIQUE, AND NOT SUMMARY, TASKS PROMOTE CRITICAL READING

Presenting Author: Gala Campos, The Pennsylvania State University, United States; **Co-Author:**Alexandra List, The Pennysylvania State University, United States; **Co-Author:**Lily A. Russell, The Pennsylvania State University, United States; **Co-Author:**Hongcui Du, The Pennsylvania State University, United States; **Co-Author:**Zheng Yao, The Pennsylvania State University, United States

We operationalize critical reading as students' abilities to recognize marginalizing narrative frames and language use in texts. Undergraduates (N=172) were presented with three texts about low birth rates, constructed to include subtly misogynistic themes (e.g., holding women individually responsible for low birth rates rather than recognitive these as a complex social issue). Students were randomly assigned to summarize or critique three complementary texts during reading, or were assigned to a control group. No differences in comprehension performance were identified. However, students' assignment to the critique condition was associated with improved critical reading scores, assessed via a set of open-ended questions directing students to identify narrative themes and recognize author intent across texts. Moreover, comprehension performance was significantly associated with critical reading. Thus, this study provides evidence for the ways that critical reading outcomes may be fostered. Additional results examining students' critical processing during reading will be introduced.

RECURSIVITY IN ARGUMENTATIVE WRITING BASED ON CONFLICTING SOURCES

Presenting Author: Christian Tarchi, University of Florence, Italy; **Co-Author:**Ruth Villalon, University of Cantabria, Spain; **Co-Author:**Nina Vandermeulen, Umeå University, Sweden; **Co-Author:**Lidia Casado Ledesma, University of Florence, Italy; **Co-Author:**Anna Paola Fallaci, University of Florence, Italy

Reading sources with conflicting information is a common activity at university. Students are often faced with multiple-text comprehension tasks with the goal of integrating information and producing an argumentative synthesis; an activity which involves the critical use of reading and writing. Recursivity is a self-regulatory cognitive process playing a very important role in these activities, as it supports the monitoring of the writer's behavior. However, as far as we know, there are no studies that have analyzed its contribution to multiple-text comprehension and argumentative synthesis writing using a multimodal approach.Our objectives were: 1) to describe recursivity behavior (based on keystroke logging data) in university students while reading conflicting sources and writing argumentative synthesis; 2) to investigate the association between the frequency of recursivity and the quality of essays and the recall of the sources; 3) to associate recursivity events with strategic behavior, assessed by think-aloud during reading.Forty university students participated in the study. Participants read four texts on a controversial topic with the goal of writing an argumentative essay. Students' reading activity was registered through a think-aloud protocol. During the writing task, students' recursivity was recorded with Inputlog. One week later they completed a recall task.We found an association between reading strategies manifested through think-aloud and recursivity. We also found an association between the level of recursivity and recall. We did not find an association between recursivity and the quality of the argumentative synthesis. Educational implications will be discussed.

Session Q 5

26 August 2023 08:00 - 09:30
UOM_A03
Symposium
Learning and Social Interaction

Processes and effects of teacher collaboration on school improvement

Keywords: Cooperative/Collaborative Learning, Pandemic, Social Interaction, Teacher Effectiveness, Teacher Professional Development
Interest group:
Chairperson: Andrea Wullschleger, University of Applied Sciences and Arts Northwestern Switzerland PH (FHNW), Switzerland
Chairperson: Katharina Maag Merki, University of Zurich, Switzerland
Discussant: Eva Kyndt, Swinburne University of Technology, Australia

Teacher collaboration is essential for successful improvement processes in schools (Muckenthaler et al., 2020; Nguyen & Ng, 2020). The core idea is that high-quality collaboration is an effective way for schools, teams, and teachers to develop professionally, thereby improving the quality of instruction and student

learning (Ronfeldt et al., 2015; Spillane & Louis, 2002). Although teacher collaboration has been widely researched, several shortcomings exist. Especially in understanding the processes and effects, previous work remains rather undifferentiated (Wullschleger et al., 2020).Considering these gaps, the overarching questions of the symposium are to what extent collaboration is effective for teacher professionalization and student learning, and which collaboration processes are particularly relevant for school improvement. Suter et al. explore the effects of teacher collaboration on teachers' perceived professionalization, the role of pre-pandemic collaboration experiences, and the mediating effect of schools' collective self-efficacy during the pandemic. Wullschleger et al. examine the impact of collaboration ties perceived as useful for school improvement on the development of 5th graders' math achievement and the mediating role of instructional quality. Warwas et al. research how vocational education teachers discuss didactic elements during collaborative instructional planning and how they arrive at didactic decisions. Finally, Baez et al. investigate the typology of class teams regarding the frequency, depth and focus of collaboration, relating it to context characteristics. This symposium extends previous research, clarifying different aspects of collaboration processes and effects by using different methods, focusing on different actors, and including different grade levels and school types.

Schools' collaborative practices during the COVID-19-pandemic and their longitudinal effects

Presenting Author: Francesca Suter, University of Teacher Education of the Grisons, PHGR, Switzerland; **Co-Author:**Tobias Feldhoff, Johannes Gutenberg University of Mainz, Germany; **Co-Author:**Katharina Maag Merki, University of Zurich, Switzerland; **Co-Author:**Falk Radisch, Institute of school education and educational research, Germany; **Co-Author:**Nina Jude, University Heidelberg, Germany; **Co-Author:**Stefan Brauckmann-Sajkiewicz, Alpen-Adria-University, Institute of instructional and school development, Austria

After the outbreak of the COVID-19 pandemic, schools needed to continuously adapt to pandemic-related regulations and challenges, including the ad hoc transition to remote learning. According to theories about school improvement and professionalisation, collaborative practice is helpful when dealing with related issues. As there have not been any studies analysing collaboration longitudinally during the COVID-19 pandemic, we investigated how schools' collaborative practices before and during the pandemic affected teachers' perceived professionalisation, and how schools' collective self-efficacy acted as a mediator. For this study, N = 280 school principals from Germany, Austria, and German-speaking Swiss cantons participated in two online questionnaires in 2020 and 2021. Results from the structural equation model reveal that schools' collaborative practices were positively related to schools' perceived professionalisation in the second year of the pandemic, but not in the first year. Pre-pandemic experiences were important predictors of collaborative practice during the pandemic. Schools' collective efficacy in dealing with the pandemic mediated the relationship between pre-pandemic experiences with collaboration and perceived professionalisation. However, the indirect effect via schools' collaborative practices during the pandemic was not significant. The results highlight the importance of collaboration and collective efficacy to navigate emergencies such as a pandemic. However, to be effective in professionalisation, the regulation of collaborative practices during the pandemic must be implemented for a longer time period. At the conference, implications for practice will be discussed.

How effective is a high amount of teacher collaboration that is perceived as useful?

Presenting Author: Andrea Wullschleger, University of Applied Sciences and Arts Northwestern Switzerland PH (FHNW), Switzerland; **Co-Author:**Katharina Maag Merki, University of Zurich, Switzerland; **Co-Author:**Urs W. Grob, University of Zurich, Switzerland; **Co-Author:**Beat Rechsteiner, University of Zurich, Switzerland

From a theoretical perspective, it can be assumed that teacher collaboration has a positive impact on the quality of instruction and, through it, ultimately on the quality of student learning (Spillane & Louis, 2002). So far, this logic of effects hasn't been empirically analyzed using mediating models. Therefore, the purpose of the present study is to examine the effects of the amount of teacher collaboration perceived as useful for school improvement on the development of student math achievement among 5th graders, and the mediating role of instructional quality development. Using social network data on collaborations of 128 teachers in their school teams, we applied multilevel structural equation models to investigate the effects of collaboration on instructional quality development and student achievement growth. Findings reveal no direct effect of teachers' amount of useful collaboration ties on student achievement development, but an indirect effect mediated by instructional quality. The results not only confirm the theoretically proclaimed indirect effect of collaboration on student achievement mediated by instructional quality, but they also support previous studies arguing that it is especially the implementation of higher quality collaboration that is effective.

Micro-processes of teacher collaboration: Professional communication related to teaching

Presenting Author: Julia Isabella Warwas, University of Hohenheim, Germany; **Co-Author:**Christian Schadt, University of Hohenheim, Germany

A profound dialogue on effective teaching counts among the critical success factors of teacher collaboration aiming at instructional improvement. Nevertheless, few empirical studies attend to these communicative micro-processes of collaborative work. To enhance scientific knowledge on these processes and to identify communicative features with the potential to foster professional learning and effective teaching of its participants, a systematic literature review of studies published in international journals following PRSIMA guidelines formed the basis of our research. A structured content analysis of the selected articles (N = 88) led to a classification of features that we label Professional Communication about Teaching (PCT) and that span two major areas, i.e. regulation of the course of conversation and content-related arguments. We adapted this general classification to construct a coding scheme to study communication about a central element of instructional planning, namely the selection of learning tasks for students. Implementing an expert-novice research-design, we recorded and analyzed discussions among prospective and practicing teachers (N = 14 'dyads'). All teacher-dyads were given a situational vignette together with three learning tasks from their future/actual instructional domain (business education) and prompted to choose the task that would stimulate student learning best. Results indicate superior performance of expert teachers in terms of the categories of PCT. Our comparative analyses further suggest that those teams that score high on these categories also come to the best joint decision among the learning tasks, supporting the important role of PCT in teacher collaboration.

Teacher Collaboration in Class Teams: Network characteristics and Typology

Presenting Author: Charlotte Baez, St.Gallen University of Teacher Education, Switzerland; **Co-Author:**Franziska Vogt, St.Gallen University of Teacher Education, Switzerland; **Co-Author:**Doris Kunz Heim, PH FHNW, Switzerland

Teacher collaboration plays a crucial role in the development of schools and the improvement of teaching. The collaboration amongst teachers teaching a given class (class team) has not yet been examined. The study aims to establish whether there is a typology of class teams regarding their collaboration, distinguishing frequency, depth and focus of the collaboration. As the teachers of the class team teach the same class in different subjects, a focus of collaboration on Classroom Management could be assumed to be more relevant for teacher collaboration than students' progress in the subject. Furthermore, the relations between collaboration and teacher stress is of interest. The study involves of 32 class teams teaching 5th grade primary classes, in total 122 teachers and 545 students. Measures include teacher and student questionnaires, teacher interviews and observation; for analysis, network analysis, cluster analysis and analysis of variance are employed. Five clusters of class teams were found, differing in frequency and focus of collaboration as well as teacher stress: (a) collaboration within standards set by the school, (b) little collaboration, (c) collaboration under pressure focusing on student performance, (d) moderate collaboration under no pressure, and (e) moderate collaboration under no pressure. The typology raises issues concerning teacher collaboration intensity and the focus of collaboration, as well as teacher perception of the class and their perceived stress. Future research is needed to entangle the relations between the situation in a school, the characteristics of teacher collaboration and their network, and teacher perceived stress.

Session Q 6

26 August 2023 08:00 - 09:30
AUTH_DC3
Single Paper
Higher Education, Learning and Instructional Technology, Teaching and Teacher Education

Online Teaching during COVID-19

Keywords: Attitudes and Beliefs, Curriculum Development, E-learning/ Online Learning, Higher Education, In-service Teachers, Pandemic, Qualitative Methods, Self-regulated Learning and Behaviour, Teacher Professional Development, Teaching Approaches, Teaching/Instructional Strategies, Well-being

Interest group: SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Maria De Haan, Utrecht University, Netherlands

How does teacher adaptability influence positive attitudes towards online teaching during COVID-19?
Keywords: Attitudes and Beliefs, In-service Teachers, Pandemic, Self-regulated Learning and Behaviour
Presenting Author: Mingyao Sun, The University of Hong Kong, Hong Kong; **Co-Author:**Xianhan Huang, The University of Hong Kong, Hong Kong; **Co-Author:**Chun Lai, The University of Hong Kong, Hong Kong; **Co-Author:**Caixia Sun, Huzhou University, China

During the COVID-19 epidemic, teachers' positive attitudes towards online teaching are necessary to ensure the quality of online teaching and students' academic performance. Based on self-regulated learning theory, teacher adaptability can be used as a predictor of the teacher's positive attitudes. Existing empirical studies have limited research on teacher adaptability, and nearly no research has explored its influence on positive attitudes towards online teaching. A questionnaire survey on 1,180 showed that the teacher's cognitive adaptability was positively and significantly related to their positive attitudes toward online teaching, however, the teacher's behavioural adaptability and emotional adaptability were not. The research can promote the theoretical construction of teacher adaptability and have practical significance for improving teachers' online teaching effectiveness.

Experiences of teachers with digital learning during the COVID-19 pandemic: an exploratory research
Keywords: Attitudes and Beliefs, E-learning/ Online Learning, Qualitative Methods, Well-being
Presenting Author: Adriaan Vervoort, UHasselt, Belgium; **Co-Author:**Katrien Struyven, Hasselt University / Vrije Universiteit Brussel, Belgium; **Co-Author:**Wendy Schouteden, Hasselt University, Belgium; **Co-Author:**Mario Gielen, Hasselt University, Belgium

The COVID-19 health crisis, in which distance and online learning became the norm, is a source of information in terms of experiences with digital education. Based on models of digital competencies and digital education, a conceptual model was used to gather these new experiences with digital education. Qualitative data was collected in online focus groups using a semi-structured interview guide based on the principles of appreciative inquiry. Four major themes and six associated topics were identified. Results show that the sudden transition to online distance learning had a noticeable impact on the emotional and mental wellbeing of teachers. Time is needed to make a durable transition to digital education guided by clear, uniform, stable, and transparent school policies.

Teaching online during the COVID-19 pandemic: an observational study
Keywords: Higher Education, Pandemic, Teaching Approaches, Teaching/Instructional Strategies
Presenting Author: Carlos González, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Daniel Ponce, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Macarena Yancovic, Universidad Finis Terrae, Chile

Despite the prevalence of video-conferencing as a medium of instruction during the COVID-19 pandemic, there is extremely little observational research focusing on online interaction in this context. We present the results of a study of online classroom interaction during COVID-19 quarantine in Chile. 146 higher education teachers were observed twice over a period of two years. An adapted version of the well-known COPUS observation protocol was employed. Following suggestions by Hora, we calculated "practice triads" (a combination of codes simultaneously occurring in a two-minute observation segment). A hierarchical cluster analysis was carried out with them. Three emerged. Figure 1 presents its main features. The first one (n=43, 29,5% of the sample) represents a relatively higher use of technology, mainly when guiding the class and presenting content. The second (n=58, 39,7%) has high activity in connecting with the professional area. Most present codes are guiding the class and connecting with the professional area, and presenting information and connecting with the professional area. The third (n=45, 30,8%) represents a group focused mostly on guiding the class and presenting information. Results suggest that during the pandemic, higher education teachers made an effort to advance from simple information delivery to more interactive classes where the use of technology and connecting with the professional area became prevalent. These are important elements that should be encouraged in post-pandemic higher education teaching.

Portuguese teachers' adaptation and pupil level of participation during the COVID-19 pandemic
Keywords: Curriculum Development, In-service Teachers, Pandemic, Teacher Professional Development
Presenting Author: Maria A. Flores, University of Minho, Portugal; **Co-Author:**Alexandra Barros, University of Lisbon, Portugal; **Co-Author:**Ana Veiga Simão, Faculty of Psychology, University of Lisbon, Portugal; **Co-Author:**Eva Fernandes, University of Minho, Portugal; **Co-Author:**Paulo Flores, University of Minho, Portugal; **Co-Author:**Paula Costa Ferreira, University of Lisbon, Portugal

This paper draws on data from a broader piece of research focusing on Portuguese teachers' perceptions and experiences of remote teaching in times of COVID-19 pandemic. In total, 2638 teachers participated in the study. Data were collected through an online survey which included both closed and open-ended questions. Findings suggest that overall teachers experienced a positive adaptation process and were able to teach according to what they had planned. However, difficulties were also found. These relate to reconciling work with family life and extra workload in the context of remote teaching. In addition, findings show that pupils from lower socioeconomic backgrounds present a lower level of participation in learning tasks. Differences as a function of gender and age were identified. Implications of the findings are discussed.

Session Q 7

26 August 2023 08:00 - 09:30
UOM_A10
Single Paper
Instructional Design

Instructional Design for Multimedia Learning

Keywords: Assessment Methods, Classroom Assessment, Comprehension of Text and Graphics, Cooperative/Collaborative Learning, Immersive Technologies for Learning, Instructional Design, Learning Strategies, Multimedia Learning, Video-based Learning
Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 06 - Instructional Design
Chairperson: Maria Birbili, Aristotle University of Thessaloniki, Greece

Combining Physical and Mental Self-management Strategies in Multimedia Learning: Best of Both Worlds
Keywords: Comprehension of Text and Graphics, Instructional Design, Learning Strategies, Multimedia Learning
Presenting Author: Björn de Koning, Erasmus University Rotterdam, Netherlands

The self-management principle holds that higher learning performance is obtained when learners actively use instructional strategies to manage the working memory load imposed by a learning task. This principle is a relatively recent development within Cognitive Load Theory (CLT) and provides a new approach to support learning. Research on self-managed learning with spatially separated, but mutually referring, text and pictures shows that using a physical (e.g., dragging-and-dropping text to picture) or mental (imagining dragging-and-dropping text to picture) integration strategy improves learning. However, similar benefits were not obtained when trying to use two physical strategies together. It is likely that this is because of higher working memory demands due to cognitive costs associated with coordinating two physical movements simultaneously. The present study investigated whether combining a physical and a mental strategy better supports learning and is more effective than either of the individual strategies alone. Eighty-four university students studied a spatially separated text and picture about an electrical circuit (presented on paper) in one of four conditions (random assignment) resulting from a 2 (physical strategy: yes/no) × 2 (mental strategy: yes/ no) between-subjects design. Participants rated their cognitive load after learning and completed retention, comprehension, and transfer tests. Results showed that participants using the physical and mental strategies combined reported a lower cognitive load after learning than participants using the physical strategy. There were no significant differences between the conditions on retention, comprehension, and transfer tests. These results suggest that combining physical and mental strategies is most efficient for learning.

Effects of signaling in a collaborative virtual reality learning environment
Keywords: Cooperative/Collaborative Learning, Immersive Technologies for Learning, Instructional Design, Multimedia Learning
Presenting Author: Patrick Albus, Ulm University, Germany; **Co-Author:**Tobias Drey, Institute of Institute of Media Informatics, Ulm University, Germany; **Co-Author:**Tina Seufert, Ulm University, Germany

Virtual reality (VR) is a technology of increasing importance that offers great potential for collaborative learning, which can have a positive impact on learning outcomes and cognitive load. At the same time, virtual learning environments are highly visual and learners need instructional support. In this study, we therefore analyzed the effects of two different approaches of collaborative learning (symmetric vs. asymmetric) and additionally the effects of signaling on learning outcomes and cognitive load in a highly immersive VR learning environment. We analyzed *N*=148 learners who were randomized in pairs to the signaling or the non-signaling condition and to the symmetrical or the asymmetrical collaborative condition. We measured learning outcomes (recall, comprehension & transfer) and cognitive load (intrinsic, extraneous & germane cognitive load) as dependent variables. The signaling condition achieved significantly higher recall and comprehension performance compared to the non-signaling condition. There was also a reduction in extraneous cognitive load when signals were used. We found no significant differences in learning outcomes between the symmetric and the asymmetric condition, but we found higher intrinsic and germane cognitive load in the asymmetric condition than in the symmetric condition. The results highlight the importance of signaling in collaborative VR learning environments and also show that both symmetric and asymmetric collaborative learning approaches can be appropriate in VR learning environments in terms of learning outcomes.

Decreasing (passive) extraneous load without reducing (active) effort? - A signaling study
Keywords: Assessment Methods, Instructional Design, Multimedia Learning, Video-based Learning
Presenting Author: Swantje Tannert, University of Erfurt, Germany; **Co-Author:**Mathias Berg, University of Erfurt, Germany; **Co-Author:**Meret Hanses, University of Erfurt, Germany; **Co-Author:**Friederike Luise Hahmann, University of Erfurt, Germany; **Co-Author:**Katharina Ockl, University of Erfurt, Germany; **Co-Author:**Inga Glogger-Frey, University of Erfurt, Germany

Processing of videos can be highly demanding and might even exhaust cognitive resources (Guo et al. 2014, Mayer et al., 2020) due to a high amount of cognitive load (Sweller, 1988, 1998). Multimedia design-principles (Mayer, 2020) like signaling (vanGog et al., 2014) reduce extraneous cognitive load and lead to better learning outcomes (Alpizar et al., 2020; Schneider et al., 2018). However, in order to load-optimize learning material, one needs to access the load of different versions. Measuring extraneous cognitive load by self-report is not trivial (De Jong, 2010). When trying to find design principles in order to reduce processing costs of video material, one aims at reducing the material induced cognitive load, which is called passive cognitive load (Klepsch & Seufert, 2021). However, many studies also measure cognitive load by asking for the invested effort (active cognitive load). In the present study an active load measure is compared to a passive load measure in an application of the signaling principle. Therefore, 98 participants were presented with a video containing either spotlight signaling (n = 41) or no signaling (n = 57). Passive extraneous cognitive load was measured using an adaption of the usability scale from Moon & Ryu (2021), active extraneous load was measured using the single item of Paas (1992). Results show signaling effects on cognitive load only for active cognitive load measured by the Paas (1992) scale.

Multimedia Effects in Testing: A Systematic Review and Meta-Analysis
Keywords: Classroom Assessment, Comprehension of Text and Graphics, Instructional Design, Multimedia Learning
Presenting Author: Marlit Annalena Lindner, IWM - Leibniz-Institut für Wissensmedien, Universität Tübingen, Germany; **Co-Author:**Lauritz Schewior, IPN – Leibniz Institute for Science and Mathematics Education, Germany

This work addresses multimedia effects in the context of testing and problem solving with a specific emphasis on potential moderating factors at the task and test-taker level. We aim to reconcile the heterogeneity of findings across subject domains and research areas to improve our understanding of the existing empirical database in the field and to derive future research directions. To draw a broader picture than a previous meta-analysis in the field (Hu et al., 2021), we combine a systematic narrative review (to include as many relevant studies as possible) with a meta-analytic approach (which focuses on more homogeneous findings from comparable experimental designs) in order to optimally extract the inherent information from the database of *n* = 57 relevant primary studies, which we identified in a systematic literature search, to answer our research questions. The data analysis is currently ongoing and will be ready for presentation at the EARLI conference 2023.

Session Q 8

26 August 2023 08:00 - 09:30
AUTH_TE2
Single Paper
Instructional Design, Lifelong Learning, Motivational, Social and Affective Processes

Vocational and Workplace Learning

Keywords: At-risk Students, Communities of Learners and/or Practice, Cooperative/Collaborative Learning, In-service Teachers, Informal Learning, Instructional Design, Lifelong Learning, Metacognition, Mixed-method Research, Motivation, Problem Solving, Self-regulated Learning and Behaviour, Tool Development, Vocational Education and Apprenticeship Training
Interest group: SIG 14 - Learning and Professional Development, SIG 17 - Methods in Learning Research
Chairperson: Nina Bonderup Dohn, University of Southern Denmark, Denmark

Does reading help in choosing a career? A mixed-methods study in the vocational transition system
Keywords: At-risk Students, Mixed-method Research, Motivation, Vocational Education and Apprenticeship Training
Presenting Author: Jule Hangen, Goethe University Frankfurt, Germany; **Co-Author:**Julia Gorges, Philipps-Universität Marburg, Germany; **Co-Author:**Eveline Wuttke, Goethe-Universität Frankfurt, Germany

The goal of the transition system is to prepare students for vocational training and, ultimately, to get students into work. Looking at the previous school careers of these students, a widespread obstacle to entering vocational training seem to be a lack of reading competence and reading motivation. From the perspective of the Social Cognitive Career Theory the present study aimed to examine the role of reading for the career orientation of adolescents in the transition system. In a mixed-methods study set in the transition system in Hesse students completed a standardized questionnaire and participated in a guided interview. Results show that students in the transition system have a medium level of motivation to read; quite a few enjoy reading and do so for pleasure. Reading texts, for which students use a variety of sources and media, makes an important contribution to career orientation and seems to be relevant for the development of specific career plans, but also holds some challenges for students.

Macro-Scaffolding in Vocational Education: Coherence and Adaptivity of Instructional Design
Keywords: In-service Teachers, Instructional Design, Tool Development, Vocational Education and Apprenticeship Training
Presenting Author: Manon Heuer-Kinscher, Goethe University Germany, Germany; **Co-Author:**Gerhard Minnameier, Goethe-University Frankfurt, Germany; **Co-Author:**Rico Hermkes, Goethe-Universität Frankfurt, Germany; **Co-Author:**Benjamin Herbert, Goethe Universität Frankfurt a.M., Germany

Effective support of learning processes does not begin in the classroom, but with the coherent and student-adaptive structuring and sequencing of lessons. In the context of teaching quality research this is referred to as "macro-scaffolding". The paper presents a method for the assessment of scaffolding patterns and their coherence and adaptivity. Lesson plans of 30 classes of vocational schools in the German state of Hesse, in which a lesson on the topic of the quantitative and qualitative comparison of offers was held by the respective subject teacher, serve as the data basis.In the data analyzed so far (N= 15 lesson plans), typical patterns of lack of adaptivity or coherence emerge, which might lead to learning difficulties and thus an increased need for micro-scaffolding in class or deficiencies of the ultimate learning outcomes. Through the application of the newly developed method, omitted learning steps are made visible which are

decisive for the logical connection between content areas. Results so far indicate that active-constructive discussion rarely takes place.

Informal Learning Strategies in the Workplace: What they are and how to foster them
Keywords: Informal Learning, Metacognition, Self-regulated Learning and Behaviour, Vocational Education and Apprenticeship Training
Presenting Author: Katja Häußermann, Ulm University Institute of Psychology and Education, Germany; **Co-Author:**Anne Frieda Doris Kittel, Ulm University, Germany; **Co-Author:**Tina Seufert, Ulm University, Germany

Employees learn by 70-90 % informally because formal learning opportunities are not individual enough in times of constant change. Since informal learning processes as reflection are learner controlled, feedback on effective strategy use is mostly lacking and learners might not know how to use learning strategies adequately. Therefore, this study‘s aim was to promote effective use of informal learning strategies via a microlearning training approach. 57 employees participated in a 2x2 design with the factors prompts and strategy information. The randomized groups differed in the receipt of media strategy information aiming at closing knowledge gaps and prompts that tended to activate learning strategies. Additionally, synergetic effects of prompts and information were investigated. In a pre- and posttest and ten times over a month metacognitive strategy knowledge and strategy use were collected and compared between groups. Strategy use for the prompt groups were examined via time series analyses. Individual and external job characteristics were examined as moderators. Although information significantly increased strategy knowledge and prompts descriptively increased strategy use, no synergetic effects were found from their combination. However, positive cubic effects of informal learning strategy use emerged over time for the groups receiving prompts. Since the results raise further questions, an experience sampling study will be conducted to better understand when which informal learning strategies are used. Practical implication for companies already emerged: the microlearning approach was promising and contextual variables such as learning culture should be taken into account when designing informal learning environments.

Facilitator dialogical moves supporting learning and regulation in interprofessional teams
Keywords: Communities of Learners and/or Practice, Cooperative/Collaborative Learning, Lifelong Learning, Problem Solving
Presenting Author: Amber Kornet, Saxion University of Aplied Sciences, Netherlands; **Co-Author:**Maaike Endedijk, University of Twente, Netherlands; **Co-Author:**Sebastian Dennerlein, University of Twente, Netherlands; **Co-Author:**Tijmen Schipper, Windesheim University of Applied Sciences, Netherlands

The Dutch installation sector is facing major challenges in of the energy transition. As a result, interprofessional teams consisting of students, teachers, and employees of the installation company are formed to take up these challenges. In these so-called learning communities (LCs) learning, working and innovating are integrated when they work on a joint challenge. Facilitators are appointed to support team learning (e.g., collaborative idea generation, seeking feedback) and regulation processes (planning, monitoring, evaluation) in these interprofessional teams. Although the role of the facilitator seems very similar to a supervisor supporting student teams, it remains unknown how facilitators support participants’ learning and regulation activities in interprofessional teams to achieve their goals. To investigate this, we used the five dialogical moves found by Warwick (2016) in an embedded multiple case study of five LCs. We analysed transcriptions of the video-recordings of the 15 meetings of these learning communities to study the relation between the dialogical moves and team learning and regulation activities. Findings show that facilitators differ in their use of dialogical moves. Some primarily use requesting information, opinion or clarifications and making positive and supportive contributions, where others also use expressing shared ideas and agreement, providing evidence and reasoning and challenging ideas and refocussing talk. Facilitators using primarily two moves seem to mostly support idea generation and discussing results and unexpected outcomes. This means that other activities are less supported which can have great consequences for team performance. These outcomes help understand how team learning can be triggered in interprofessional teams.

Session Q 9

26 August 2023 08:00 - 09:30
UOM_R08
Single Paper
Learning and Social Interaction, Teaching and Teacher Education

Argumentation in Science Education

Keywords: Argumentation, Conceptual Change, Cooperative/Collaborative Learning, Dialogic Pedagogy, Higher Education, Peer Interaction, Pre-service Teachers, Science Education
Interest group: SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Daniela - Georgiana Valache (Voinescu), West University of Timisoara, Romania

Learning through problem-based argumentation: the differential effects across educational levels
Keywords: Argumentation, Cooperative/Collaborative Learning, Peer Interaction, Science Education
Presenting Author: Antonia Larrain, Universidad Alberto Hurtado, Chile; **Co-Author:**Paulina Freire, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Valeska Grau Cardenas, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Marisol Gómez, Universidad Alberto Hurtado, Chile; **Co-Author:**Patricia López, Universidad Alberto Hurtado, Chile; **Co-Author:**Diego Cosmelli, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Hernán Cofré, Pontificia Universidad Católica de Valparaíso, Chile

Evolution is a key piece of knowledge that has been shown to be very hard to learn. Problem-based argumentation may be particularly powerful in fostering conceptual understanding. However: Is collaborative argumentation more effective than individual argumentation? Is there any difference in learning through argumentation in problem-solving settings across educational levels? We conducted three experimental studies to answer these questions. In study 1 sixth-grade students (N = 136) from seven public schools in [CITY, COUNTRY] solved weekly problems of organic evolution (six weeks) in a mixed within and between 2x2 factorial design with between-subject factor problem-based orientation (argumentation versus explanation) and interaction (collaborative versus individual). The students had no formal instruction about evolution. Pre- and post-test knowledge was administered. The results showed significant changes in conceptual understanding in all conditions from pre- to post-tests, except for collaborative non-argumentation. Moreover, the group argumentative discourse significantly predicted delayed-post tests. In study 2 tenth-grade students (N = 126) from three public schools participated in a similar design with the same materials and procedures as in study 1. Students had been taught evolution in the previous year. The results showed that students in the collaborative argumentation condition were the only ones to progress between pre- and delayed post-tests. Argumentative discourse did not predict post-tests. In study 3 pre-service teachers (N = 46) from eight universities participated in a similar design with only the argumentative conditions. The results showed that students in the collaborative condition were the only group that significantly gained from pre- to post-tests.

Analysing argumentation episodes: a case study from physics teacher education
Keywords: Argumentation, Higher Education, Pre-service Teachers, Science Education
Presenting Author: Maija Nousiainen, University of Helsinki, Finland; **Co-Author:**Karoliina Vuola, University of Helsinki, Finland

Learning argumentation and its skills are central goals for science education. Domain-general argumentation has noted to be important generic skill, but it needs to be practiced in domain-specific context. We discuss here how domain-specific argumentation and skills related to it can form part of learning science in higher education. There are abundance of argumentation analysis frameworks and most of them base on Toulmin’s account. For the goals of learning physics in higher education, the use of empirical evidence is central, but attention needs to be paid to deductive knowledge formation as well. In this study, we analyse pre-service physics teachers written reports (N=36). We introduce here four argumentative moves that can be used to analyse physics knowledge argumentation. The analysis allows us to detect what kind of argumentative episodes pre-service physics teachers use in their explanations. The analysis shows that the analysis method is capable to discern argumentative episodes and the results reflect that there are remarkable differences in between pre-service physics teachers’ abilities to construct coherent arguments. We conclude that explicit teaching of argumentation may help pre-service teachers to improve their abilities to construct coherent arguments.

Toulmin's argumentation model scaffolds the coordination class concept of force: a case study
Keywords: Argumentation, Conceptual Change, Dialogic Pedagogy, Science Education
Presenting Author: Costas Naoum, University of Thessaly, Greece; **Co-Author:**vassilis Kollias, University of Thessaly, Greece

Abstract This paper presents the results from analyzing the dialogues of 8th-grade students in a collaborative argumentative environment in a physics lesson on "motion and forces". Literature reports that argumentation can be an important means for improving learning in the sciences (Henderson and al., 2018). We implemented a dialogic learning environment in which students were presented with structural and cognitive support in the construction of arguments, towards a deeper conceptual understanding. The Microgenetic Analysis of dialogues was based on utilizing the theoretical constructs of the Coordination Class Theory (CCT) (diSessa & Sherin, 1998), and Quinian bootstrapping (Carey, 2009). The analysis highlighted intertwined processes of coordination and bootstrapping, which led to students' conceptual improvement in the coordination class concept of force. The explicit use of Toulmin's model (Toulmin, 2003) in such an environment acts as a cognitive tool that induces conceptual bootstrapping, enhances coordination processes between causal networks and data, and has a positive effect on students' conceptual development.

Session Q 10

26 August 2023 08:00 - 09:30
AUTH_T102
Single Paper
Learning and Instructional Technology, Learning and Social Interaction, Motivational, Social and Affective Processes

Teachers' Expectations and Beliefs and Associations to Student Academic Outcomes

Keywords: Achievement, Attitudes and Beliefs, Cultural Diversity in School, Educational Technologies, Inclusive Education, Mentoring and Coaching, Migrant / Refugee and Minority students, Mindsets, Motivation, Primary Education, Social Aspects of Learning and Teaching, Teacher Effectiveness, Teacher Professional Development
Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education, SIG 18 - Educational Effectiveness and Improvement
Chairperson: ZOE KANTARIDOU, Greece

Teacher expectations: Contributions to student academic outcomes and beliefs
Keywords: Achievement, Attitudes and Beliefs, Primary Education, Teacher Effectiveness
Presenting Author: Christine M Davies, University of Auckland, New Zealand

Many earlier studies have established that students with high expectation teachers outperform those with low expectation teachers. The current New Zealand study was designed to investigate not just the academic outcomes for students with high or low expectation teachers, but also a range of beliefs (perceptions of teacher expectations and teacher support, academic competence, school satisfaction, and reading self-concept). The 31 teachers in this study were identified as having expectations for their class as a whole that were either 0.5 SD above or below students' actual achievement. Their 692 students completed a standardised reading test and a beliefs questionnaire at the beginning and end of the academic year. By the end of the year, controlling for beginning-year beliefs and reading achievement, students with high expectation teachers perceived that their teachers had higher expectations than those with low expectation teachers, they had more positive academic competence, school satisfaction, and reading self-concept, and their reading achievement was higher. Teacher education and professional development programmes need to encourage teachers to have high expectations for all students and to institute high expectation practices that will increase student achievement and foster positive beliefs in all students.

Teacher perceptions of student motivation: Contribution to differences in grades and achievement
Keywords: Achievement, Cultural Diversity in School, Migrant / Refugee and Minority students, Motivation
Presenting Author: Katharina Schnitzler, University of Potsdam, Germany; **Co-Author:**Cornelius Brandmiller, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Hanna Dumont, University of Potsdam, Department of Education, Germany

Whereas there is a vast body of research on the causes and consequences of teachers' perceptions of student achievement, far less is known about teacher perceptions of student motivation. Initial findings indicate that student sociodemographic characteristics predict teacher perceptions of student motivation and that teacher perceptions of student motivation affect student achievement. In the present study, we, therefore, focus on teacher perceptions of student motivation as a potential mediator between student sociodemographic characteristics and achievement. The longitudinal data of $N = 3400$ students and their 58 German and 50 mathematics teachers stemmed from a German large-scale study. We analyzed the effects of student gender, immigrant background and socioeconomic status on teacher perceptions at the beginning of grade 5 as well as the indirect effects of these sociodemographic characteristics (conveyed by teacher perceptions) on two indicators of student achievement – grades and standardized tests – one and two years later. The results showed that teachers in German and mathematics perceived boys to be less motivated than girls. Moreover, German teachers rated the motivation of students with an immigrant background lower than that of students without one. According to the indirect effects, teacher perceptions contributed to a disadvantage of boys in both German and mathematics grades after one and two years and to a disadvantage of students with an immigrant background in German grades after one year. With regard to performance in achievement tests, indirect effects of student sociodemographic via teacher perceptions played only a subordinate role.

A Systematic Review of Teacher or Coach Expectation Effects on Children's Motor Skill Learning
Keywords: Attitudes and Beliefs, Mentoring and Coaching, Mindsets, Social Aspects of Learning and Teaching
Presenting Author: Xiaoyu Zhan, University of Groningen, Netherlands; **Co-Author:**Anne de Bruijn, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Anneke Timmermans, University of Groningen, Netherlands; **Co-Author:**Esther Hartman, University Medical Center Groningen / University of Groningen, Netherlands

Physical education (PE) teachers' or coaches' expectations are potential essential factors to affect children's motor skill learning. Although existing research has focused on various aspects of PE-teacher or coach expectation effects, there is not yet a systematic review that ties them together. Therefore, this review aims to elucidate how expectations are formed, communicated, as well as how children react to and how children's motor skill learning is influenced by the expectations. A systematic literature search was conducted in four electronic databases and a total of 6,724 publications was retrieved. Two rounds of screening resulted in twenty-four included studies. The quality of included studies was evaluated using the guidelines of Law et al. (1998). Information on for example research design and findings was extracted and the results were synthesized according to the amount and consistency of the evidence. As the extraction phase hasn't been finished yet, the results are preliminary. First, PE-teachers and coaches relied on children's characteristics and their own stereotypical beliefs to form expectations. Then, PE-teachers or coaches showed differential treatment, like approaching high-expectancy children more frequently. Next, children's socio-psychological and behavioral outcomes were affected, such as self-expectations and learning time. However, not all children responded in a similar way to the expectations. Finally, only one study found that PE-teachers' expectations predicted students' final motor skill scores, and students' perceived ability played a mediating role. In the upcoming period, the evidence will be further synthesized and the final results will be presented at the conference.

Student Teachers´ Beliefs about Digital-enriched Inclusive Teaching and Learning
Keywords: Attitudes and Beliefs, Educational Technologies, Inclusive Education, Teacher Professional Development
Presenting Author: Felix Bernet, PH Weingarten, Germany; **Co-Author:**Stefanie Schnebel, University of Education Weingarten, Germany

Digital media are said to have an impact on the realisation of inclusive teaching and learning. Optimized accessibility and individualized learning are some of the central opportunities of digital instructional tools when handling diversity in the classroom. An intervention in teacher training aims to make future teachers use those possibilities of digital media when creating inclusive teaching and learning material. In the intervention group student teachers analyse digital tools for their inclusive didactical value and integrate them into their inclusive lesson planning. According to the Theory of Planned Behaviour effects of the intervention should

be found on the level of beliefs as well as planning activities. The impact of the intervention is observed assessing a questionnaire and analysing planning documents. In this contribution first results of the questionnaire data are reported. So far, the intervention has shown an effect on primary school student teachers' beliefs about the use of digital media but no effect on beliefs about inclusive teaching.

Session Q 11

26 August 2023 08:00 - 09:30
UOM_R05
Single Paper
Developmental Aspects of Instruction, Higher Education, Motivational, Social and Affective Processes, Teaching and Teacher Education

Mathematics Understanding and Engagement: Measurement Issues

Keywords: Assessment Methods, Cognitive Development, Computer-assisted Learning, Engagement, Engineering Education, Eye Tracking, Higher Education, Mathematics/Numeracy, Motivation, Primary Education, Qualitative Methods, Teacher Effectiveness, Teaching Approaches
Interest group: SIG 08 - Motivation and Emotion, SIG 18 - Educational Effectiveness and Improvement, SIG 27 - Online Measures of Learning Processes
Chairperson: Elisabeth Höhne, Leibniz Universität Hannover, Germany

When to Measure? An Exploratory Study of the Predictive Validity of Student Ratings
Keywords: Mathematics/Numeracy, Primary Education, Qualitative Methods, Teacher Effectiveness
Presenting Author:sergios sergiou, University of Cyprus, Cyprus; **Co-Author:**Charalambos Charalambous, University of Cyprus, Cyprus

Although student ratings are increasingly accepted as a promising method for assessing teaching quality, the juncture at which students should be asked to rate the quality of teaching they experience (immediately after a lesson versus at the end of a unit/a school year) in order to obtain more valid data remains an open question. Aiming to address this gap, we report on an exploratory study that examined the predictive validity of student ratings under three scenarios: (a) using student ratings at the end of different lessons; (b) employing the average of student ratings at the end of different lessons; and (c) using student ratings towards the end of the school year. We compared the predictive validity of these scenarios using students' ratings of perceived cognitive activation and their performance in a cognitively demanding algebra test as a case in point. In particular, we used both the cognitive-activation individual items as well as their grouping into factors as exploratory variables. Employing multi-level modelling (542 students nested within 30 classes/teachers) and controlling for different student, teacher, and contextual background characteristics, we found that in both cases (individual items and grouping of items into factors), the first two scenarios consistently had higher predictive validity compared to the third scenario. In discussing these findings, we consider their methodological implications for using student ratings to capture teaching quality more validly.

Using Longitudinal Data from a Digital Learning Environment to Predict Algebra Understanding
Keywords: Assessment Methods, Cognitive Development, Computer-assisted Learning, Mathematics/Numeracy
Presenting Author: Markus Spitzer, Martin-Luther Universität Halle, Switzerland; **Co-Author:**Korbinian Moeller, Centre for Mathematical Cognition, School of Science, Loughborough University, Loughborough, United Kingdom, United Kingdom

Understanding algebra is one of the most critical but difficult mathematical skills for students to learn in school as it significantly predicts later mathematic achievements as well as job prospects. Thus far, longitudinal studies from face-to-face testing indicated that understanding algebra highly depends on prior achievements in mathematics (e.g., fraction skills). The objective of the current study was to evaluate whether such findings generalize to data obtained from a large-scale digital learning environment. Therefore, we examined whether prior mathematical achievements in a digital learning environment predicted students understanding of algebra in the same digital learning environment in a longitudinal approach. Data from over 5,000 students who solved over 1 million mathematical problem sets on basic mathematical skills, fractions, and algebra was analyzed. We observed that basic mathematical skills as well as fraction skills significantly predicted algebra understanding. In sum, our findings generalize results from face-to-face testing to the context of data from online learning environments. As such, this finding suggests that data from digital learning environments may well qualify to examine children's numerical development.

Eye-tracking as a tool to study student cognitive engagement and attention in the math classroom
Keywords: Engagement, Engineering Education, Eye Tracking, Higher Education
Presenting Author: Miitta Järvinen, University of Jyväskylä, Finland; **Co-Author:**Joni Lämsä, University of Oulu, Finland; **Co-Author:**Raija Hämäläinen, University of Jyväskylä, Finland; **Co-Author:**Janne Roslöf, Åbo Akademi, Finland; **Co-Author:**Sami Lehesvuori, University of Jyväskylä, Finland; **Co-Author:**Lauri Kettunen, University of Jyväskylä, Finland

Student engagement is associated with students' learning, retention and academic success in the field of STEM education. This study explores potentials of eye-tracking data for investigating students' cognitive engagement and attention in mathematics classroom. The study develops an understanding of students' cognitive engagement and attention and explore what kind of events make students engage on a deeper level, and how their visual attention varies during different engagement levels. The research questions are 1) What kind of students' cognitive engagement is present in the math demo sessions? 2) What kind of events trigger a student to shift to a deeper (active, constructive, or interactive) engagement level? 3) How is the students' visual attention distributed during different levels of engagement? This research includes multimodal data via eye-tracking, and classroom videos in two math demo sessions that are part of a basic university math course of engineering degree programme. The recordings from four students were used to code the students' engagement according to the interactive, constructive, active and passive engagement coding framework (ICAP) (Chi & Wylie 2014) within the Classroom Observation Protocol for Interactive Engagement in STEM (COPIE-STEM) protocol developed by Hsiao et al. (2022). Passive engagement was the most common engagement level in math demo sessions. Teacher's prompts, classroom structure and peers' prompts were triggering students to engage on a deeper engagement level. Distribution of attention varied at different levels of engagement and mainly focused on whiteboard except interactive level where attention was paid to other students more than on other levels.

Effects of formative assessment on motivation via perceived competence support in 3rd graders
Keywords: Mathematics/Numeracy, Motivation, Primary Education, Teaching Approaches
Presenting Author: Larissa Aust, University of Münster, Germany; **Co-Author:**Birgit Schütze, University of Münster, Germany; **Co-Author:**Jan Hochweber, St. Gallen University of Teacher Education, Switzerland; **Co-Author:**Ralf Benölken, University of Wuppertal, Germany; **Co-Author:**Elmar Souvignier, University of Muenster, Germany

Empirical studies on effects of formative assessment on motivational outcomes and underlying mechanisms are scarce. Ryan and Deci's self-determination theory considers the experience of competence as a prerequisite for intrinsic motivation. Therefore, we investigated whether students perceived formative assessment to be supportive of the development of their competencies (perceived competence support; PCS). In this way, we aimed to test whether PCS mediates effects of formative assessment on intrinsic motivation. 26 math teachers with a total of 588 third graders participated in the study. Formative assessment was realized using two slightly different approaches: While teachers in experimental group (EG) 1 (n=7) received a tool for learning progress assessment (LPA), teachers in EG2 (n=8) were provided with the combination of LPA and additional support consisting of materials for feedback and adaptive instruction (LPA+). The control group consisted of 11 teachers. Students' PCS and intrinsic motivation were assessed at the beginning (pre-test) and the end of the school year, math achievement was measured at pre-test. A path model for half-longitudinal designs was estimated. LPA (β=0.289, p=0.039, R^2_{incr}=0.012) and LPA+ (β=0.302, p=0.067, R^2_{incr}=0.013) positively influenced students' PCS compared to the control group. PCS at T1 significantly predicted motivation at T2. For both groups, however, no significant indirect effects on motivation via PCS were found. LPA and LPA+ seem to have similar effects on PCS suggesting that providing teachers with diagnostic information on their students' progress plays a key role. Results suggest that fostering PCS in school might be a promising way in motivation-enhancing teaching.

Session Q 12

26 August 2023 08:00 - 09:30
UOM_R09
Single Paper
Instructional Design, Learning and Instructional Technology, Lifelong Learning, Teaching and Teacher Education

Critical Thinking, Trust in Science and Scientific Inquiry

Keywords: Critical Thinking, E-learning/ Online Learning, Feedback, Game-based Learning, Informal Learning, Inquiry Learning, Interest, Learning Analytics, Lifelong Learning, Metacognition, Peer Interaction, Pre-service Teachers, Problem-based Learning, Science Education, Social Sciences and Humanities
Interest group: SIG 11 - Teaching and Teacher Education, SIG 20 - Inquiry Learning
Chairperson: Katharina Asbury, Leibniz Institute for Science and Mathematics Education (IPN), Germany

Students' assessment of authentic pedagogy when learning to evaluate the trustworthiness of sources
Keywords: Critical Thinking, Inquiry Learning, Interest, Social Sciences and Humanities
Presenting Author: Maartje van der Eem, University of Amsterdam, Netherlands; **Co-Author:**J.P. van Drie, University of Amsterdam, Netherlands; **Co-Author:**Saskia Brand-Gruwel, Zuyd, University of Applied Sciences, Netherlands; **Co-Author:**Carla Van Boxtel, University of Amsterdam, Netherlands

In this study, we compared two different approaches to authentic pedagogy in history classrooms where students learned how to evaluate the trustworthiness of sources. In both approaches, students answered the same complex historical questions, using multiple sources. Only the introduction to and the phrasing of these questions differed. In the first approach, the "historical inquiry approach", students were put in the role of historians, and only the historical context was used to introduce the questions. In the second approach, the "present-oriented historical inquiry approach", examples from students' lives and current events were used in the introduction, and students were asked to answer the questions as if they were, for example, judges in a historical trial. Since authentic pedagogy can enhance motivation, it is relevant to investigate how students evaluate these two approaches. A total of 1036 grade 9 students participated, randomized at school level. They filled out a pretest and posttest measuring how interesting, useful, and important they considered learning to evaluate the trustworthiness of sources. In between, they followed three 80-minute lessons. Students evaluated each lesson (scale 1-10) on how interesting and instructive they considered the lesson. Results showed that students in the historical inquiry approach were significantly more positive after two of the three lessons than the students in the present-oriented approach. In both approaches, there was a strong correlation between students' interest and their evaluation of the instructiveness of the lessons. On the posttest, we found no significant difference between the two approaches.

Belief updating when confronted with scientific evidence: Examining the role of trust in science
Keywords: Critical Thinking, Informal Learning, Lifelong Learning, Science Education
Presenting Author: Tom Rosman, Leibniz Institute for Psychology (ZPID), Germany; **Co-Author:**Sianna Grösser, Leibniz Institute for Psychology (ZPID), Germany

In an exploratory re-analysis of existing data, we found that the more individuals trust science, the more likely they are to change their beliefs on a medico-scientific issue when confronted with scientific evidence on this issue. Hence, trust in science seems to play a role in shaping beliefs on scientific issues. However, not much is known on whether individuals with high trust in science trust science "blindly", meaning that their trust in a claim's source prevents them of adequately evaluating the claim itself (i.e., in terms of a first-hand evaluation). To investigate this more closely, we preregistered five hypotheses, which were tested in a second randomized experiment with a general population sample of N = 1,100. Participants read eight descriptions of fictitious studies, which either presented mixed evidence (i.e., diverging information) or clearly favored acupuncture over massaging (evidence direction factor). In addition, the methodological quality of the fictitious studies was experimentally manipulated by, for example, reducing their sample sizes or degree of standardization (evidence quality factor). Trust in science was measured before reading; acupuncture-related beliefs were measured pre-post. After reading, scientific literacy as well as perceived evidence quality and direction were measured. Overall, results suggest that individuals with high trust in science do not trust science blindly, but, on the contrary, are better able to evaluate the quality of scientific studies, which, in turn, protects them from being manipulated by low-quality evidence. With regard to science communication, our findings underline the importance of allowing the public to conduct first-hand evaluations.

Promoting evidence-informed reasoning in student teachers through peer feedback
Keywords: Feedback, Peer Interaction, Pre-service Teachers, Problem-based Learning
Presenting Author: Julia Hornstein, University of Augsburg, Germany; **Co-Author:**Martin Greisel, University of Augsburg, Germany; **Co-Author:**Johanna Ott, University of Augsburg, Germany; **Co-Author:**Anna Weidenbacher, University of Augsburg, Germany; **Co-Author:**Ingo Kollar, University of Augsburg, Germany

Evidence-informed reasoning is a crucial teacher competency that needs to be developed throughout the teaching studies. However, empirical research has revealed that teachers struggle with using evidence-informed reasoning. One possibility to support evidence-informed reasoning is through peer feedback. However, it can be challenging for students to provide high-quality feedback and to integrate multiple feedback messages from different peers without instructional guidance. This study therefore investigates the impacts of feedback provision prompts and feedback integration prompts on (a) feedback quality, (b) conceptual knowledge, and (c) competence acquisition. A 2x2 between-subject design was used to address the research question, and N=254 teacher students (average age M=22.56, SD=4.30, 4th semester) took part in the study. The findings demonstrate that feedback provision prompts had a positive effect on feedback quality. Additionally, neither feedback provision prompts nor feedback integration prompts exerted a main effect on the acquisition of knowledge or competence. However, there was an interaction effect for competence acquisition: feedback provision prompts had a beneficial impact only when they were employed without integration prompts. This interaction effect suggests that only part of the feedback process should be prompted at a time rather than all phases simultaneously. Future research is required to investigate these consequences.

Mapping student goal plans to scientific inquiry learning behaviors during inquiry-based learning
Keywords: E-learning/ Online Learning, Game-based Learning, Learning Analytics, Metacognition
Presenting Author: Megan Wiedbusch, University of Central Florida, United States; **Co-Author:**Alex Goslen, North Carolina State University, United States; **Co-Author:**Dan Carpenter, North Carolina State University, United States; **Co-Author:**Roger Azevedo, University of Central Florida, United States

Scientific inquiry skills are fundamental to learning the nature of science and science content by allowing students to apply, practice, and develop various scientific reasoning processes. Goal setting and planning can help learners regulate their learning as they engage with scientific inquiry, especially within investigative exploration. This paper presents the development of a new planning scaffold used by 144 middle school students during interactions with Crystal Island, a game-based learning environment designed to teach students about microbiology and through scientific inquiry. We have used this planning tool in a novel approach to map student goals and plans from the scaffold to a series of epistemic scientific reasoning activities. Using online traces of student behaviors logged within the game, we will be able to analyze student goal setting and planning constructed throughout the game. This work highlights that online-trace data should be contextualized to (sub)goals, and the design of intelligent and adaptive goal and planning tools should be dynamic to account for open-ended exploration that differs across learners.

Session Q 13

26 August 2023 08:00 - 09:30
AUTH_T202
Single Paper
Instructional Design, Learning and Instructional Technology, Teaching and Teacher Education

Eye Tracking and Gaze

Keywords: Cognitive Skills and Processes, Computer-assisted Learning, Digital Literacy and Learning, Engagement, Eye Tracking, Feedback, Game-based Learning, Higher Education, Mathematics/Numeracy, Metacognition, Quantitative Methods, Video-based Learning
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 27 - Online Measures of Learning Processes
Chairperson: Xiangyuan Feng, University of Groningen, Netherlands

Player profiles in a mathematics educational game based on eye gaze and game log data
Keywords: Computer-assisted Learning, Eye Tracking, Game-based Learning, Mathematics/Numeracy
Presenting Author: Diana-Elena Gratie, University of Turku, Alexandru Ioan Cuza University of Iasi, Romania; **Co-Author:**Erno Lehtinen, University of Turku, Finland

Educational games are used as pedagogical tools to improve student's outcomes and engagement with mathematics. Understanding the strategies that players devise to complete a task is important for enhancing students' adaptive strategies during game play. This study identifies and analyzes the player profiles of university students freely engaging with a digital mathematics game after a period of training, based on eye gaze and game log data. The participants played the Number Navigation Game, NNG, designed to promote adaptive number knowledge and flexible mathematical skills in schoolchildren aged 10-13 through game elements that are directly connected to mathematical content. We performed k-means cluster analyses (N=23) using variables computed based on eye gaze measures and game log data, and identified two playing profiles. The two data sources are complementary, the first offering insights into how broadly the players explored the game space, and the second containing the actual moves.The Navigators profile indicates fast decision-making, with low exploration of the game space, thus possibly not many alternative solutions were considered.The Explorers profile is characterized by larger exploration of the game space compared to the performed moves, which may indicate that more emphasis was given to finding alternative solutions, in order to choose the best one. No significant relationship was found between the player profiles and performance in the game, and the learning outcomes were not measured in this study, but the identified profiles relate to recent studies that show that a slow reflective process (Explorers, here) results in better game-based learning.

What was I doing? Gaze-display feedback to support students' monitoring and learning in radiology
Keywords: Eye Tracking, Feedback, Higher Education, Metacognition
Presenting Author: Ellen Kok, Utrecht University, Netherlands; **Co-Author:**Diederick Niehorster, Humanities Lab Lund, Sweden; **Co-Author:**Anouk van der Gijp, UMC Utrecht, Netherlands; **Co-Author:**Dik Rutgers, UMCU, Netherlands; **Co-Author:**William Auffermann, University of Utah, United States; **Co-Author:**Marieke van der Schaaf, UMCU, Netherlands; **Co-Author:**Liesbeth Kester, Utrecht University, Netherlands; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

Monitoring task performance is difficult. This is particularly true in complex visual tasks such as radiograph interpretation, as few overt actions take place that can inform monitoring. Eye-tracking technology can be used to measure viewing behavior, which can provide information about visual search and decision making, and make it overt in a visualization. We hypothesize that such gaze-display feedback could potentially impact performance when learning to interpret radiographs. We investigated two types of gaze-display feedback: 1) Search displays, showing which part of the image is searched. All areas looked at for at least 100 ms were colored red. 2) Decision displays, showing which parts of the image received prolonged attention (i.e., where decision making was likely suboptimal), all areas looked at for at least 1000 ms were colored red. 78 medical students (54 female) were taught how to detect abnormalities on radiological images using a complete search strategy. After a pretest and instruction, they practiced this on 16 cases with gaze-display feedback (search display or decision display) after each case. The control condition did not receive feedback. Next, a 12-item posttest (without feedback) was made. Afterwards, participants reported on self-efficacy, perceived confidence, and perceived usefulness of the feedback. For both the practice and the posttest phase, participants made global and local item-by-item confidence ratings. In contrast to our expectations, Bayesian analyses showed no benefits of the gaze displays on score, local and global (absolute) monitoring accuracy, completeness of viewing behavior, self-efficacy, and perceived competence.

Uncovering learning from video: Cued-retrospective Reporting vs. Concurrent-Retrospective Reporting
Keywords: Cognitive Skills and Processes, Digital Literacy and Learning, Eye Tracking, Video-based Learning
Presenting Author: Marijn Gijsen, University of Antwerp, Belgium; **Co-Author:**Charlotte Van Tricht, University of Antwerp, Belgium; **Co-Author:**Leen Catrysse, Open Universiteit, Department of Online Learning and Instruction, Belgium; **Co-Author:**Sven De Maeyer, Antwerp University, Belgium; **Co-Author:**David Gijbels, University of Antwerp, Belgium

Learning with the help of multimedia is gaining importance, the COVID-19 pandemic accelerated this rise stressing the importance for further insights into learning from video and the research methods that can be used to accomplish this like for example think-alouds. Therefore, this study investigated the amount and quality of cognitive processing information elicited by means of concurrent, retrospective, and cued-retrospective reporting in learning from video. A within-subjects design experiment with 26 participants was conducted in a lab setting, using interactive instructional videos of statistics to compare all three reporting methods. The method of cued-retrospective reporting used the original video and a superimposed record of the participants' eye-movements and fixations as a cue for retrospection. Qualitative and quantitative analyses revealed several differences between the retrospective, cued retrospective, and concurrent reporting. On the qualitative level, less information was detected in the concurrent reporting while more detailed explications were elicited during cued-retrospective reporting. On the quantitative level, cued-retrospective reporting showed significantly higher medians compared to concurrent reporting on the total amount of codes, the surface level strategies and the regulatory strategies. The same results were found when comparing the cued-retrospective condition to the non-cued-retrospective condition. No significant difference was found in the deep level strategies. Both qualitative and quantitative findings highlight the difference between both methods. The results show that cued-retrospective reporting could be an interesting method to use in further studies in the field of learning from video.

Investigating student gaze synchrony in the classroom as indicator of student engagement
Keywords: Cognitive Skills and Processes, Engagement, Eye Tracking, Quantitative Methods
Presenting Author: Babette Bühler, Hector Research Institute of Education Sciences and Psychology, Germany; **Co-Author:**Efe Bozkir, University of Tübingen, Germany; **Co-Author:**Patricia Goldberg, University of Tübingen, Germany; **Co-Author:**Peter Gerjets, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Ulrich Trautwein, University of Tübingen, Germany; **Co-Author:**Enkelejda Kasneci, Technical University of Munich, Germany

Automated behavioral analysis of students in the classroom with the aim of estimating student engagement is very popular, for instance focusing on single student's gaze directions as a cue for attention. Because behavioral cues are very context-dependent and their meaning depends on the particular learning situation, we argue that the orchestration of all students' gaze in the classroom contains valuable information. In this study, we examine whether a student's gaze synchrony to their classmates during a lesson is related to their self-reported engagement. To assess this, we employ computer vision techniques for continuous student gaze estimation and introduce a new approach to measure gaze synchrony in real-world classrooms. The employed dataset consists of seven videos of real lessons with N = 73 student instances from grades 6 to 12 and corresponding engagement self-reports. We find a weak, non-significant positive relationship between engagement self-reports and the calculated gaze synchrony scores at the student level. In the next step, we plan to investigate temporal patterns of gaze synchrony, as well as class orchestration of further behavioral cues, such as pose estimation.

Session Q 14

26 August 2023 08:00 - 09:30
UOM_A02
Single Paper
Cognitive Science, Instructional Design, Learning and Instructional Technology

Comprehension of Text and Graphics

Keywords: Cognitive Skills and Processes, Communication Skills, Comprehension of Text and Graphics, E-learning/ Online Learning, Higher Education,

Learning Strategies, Misconceptions, Multimedia Learning, Quantitative Methods, Reading, Science and STEM, Science Education, Student Drawings
Interest group: SIG 02 - Comprehension of Text and Graphics
Chairperson: Ilias Karasavvidis, University of Thessaly, Greece

Ideally Easy and Scientific? Text Features, the Role of Reader Characteristics and Trustworthiness
Keywords: E-learning/ Online Learning, Quantitative Methods, Reading, Science Education
Presenting Author: Mark Jonas, Leibniz Institute for Psychology (ZPID), Germany; **Co-Author:**Martin Kerwer, Leibniz Institute for Psychology (ZPID), Germany; **Co-Author:**Anita Chasiotis, Leibniz Institute for Psychology (ZPID), Germany; **Co-Author:**Tom Rosman, Leibniz Institute for Psychology (ZPID), Germany

In a time characterized by an increasing availability of online science information and a growing prevalence of fake news, conspiracy theories and science denial, understanding factors contributing to the perceived trustworthiness of scientific publications is vital. Previous research demonstrated an effect of text easiness and scientificness on lay readers' trust in science. However, both the easiness- and the scientificness-effect have mainly been examined separately, without focus on potential interactions or confounds. Additionally, it is conceivable that individual variations of the easiness-effect and scientificness-effect arise from reader differences in epistemic justification beliefs or need for cognitive closure (NCC).To jointly examine both effects and explore the influences of readers' epistemic justification beliefs and NCC, we carried out a preregistered online study with N = 1,467 German general-population lay readers. Readers received four short research summaries based on published psychological journal articles that systematically varied text easiness and scientificness in a 2x2 design (low vs. high). After each summary, ratings of text and author trustworthiness were collected. In addition, participants completed questionnaires related to their individual epistemic justification beliefs and NCC. Mixed-model regression analyses revealed that higher text scientificness significantly predicted increases in text and author trustworthiness. Furthermore, an interaction effect between scientificness and personal justification beliefs as well as justification by multiple sources emerged. However, no significant effects were found regarding text easiness. Implications for future studies and for increasing the trustworthiness of lay-friendly research summaries in light of reader characteristics will be discussed.

Knowledge revision during reading – do pictures reduce the activation of outdated information?
Keywords: Comprehension of Text and Graphics, Misconceptions, Multimedia Learning, Reading
Presenting Author: Pauline Frick, Leibniz-Institut für Wissensmedien (IWM), Germany; **Co-Author:**Panayiota Kendeou, University of Minnesota, United States; **Co-Author:**Anne Schueler, Leibniz-Institut für Wissensmedien, Germany

In this study, we investigated whether pictures can reduce the influence of outdated information during reading comprehension. Previous research suggests that outdated information (i.e., information initially believed to be true but then updated) is often automatically activated when reading content related to that information. This automatically activated outdated information can hamper comprehension. Drawing on the Knowledge Revision Components framework (Kendeou & O'Brien, 2014), we theorize that one core component of knowledge revision is the reduction of the activation of outdated information. Thus, we investigated whether illustrating the updated information with a picture can prevent the activation of outdated information during reading. In doing so, we adapted a version of the contradiction paradigm (O'Brien et al., 2010) in which participants (N = 421) read texts that contained solely information that was consistent with a later target sentence (i.e., consistent condition) or that contained information that was inconsistent with the target sentence but was updated before reading the target sentence (i.e., outdated condition). Additionally, we varied whether the texts were illustrated by pictures or not. Results only partly confirmed our hypothesis. As expected, for the outdated condition, results showed faster reading times for the target sentences if the texts were illustrated compared to when the texts were not illustrated. Unexpectedly, the same result was observed for the consistent condition. Further studies are needed to determine whether pictures can reduce the activation of outdated information.

Exploring students' use of self-constructed diagrams when writing answers to test questions
Keywords: Communication Skills, Higher Education, Learning Strategies, Student Drawings
Presenting Author: Emmanuel Manalo, Kyoto University, Japan; **Co-Author:**Mari Fukuda, Simon Fraser University, Canada

The ability to construct and use diagrams in demanding communicative situations is a valuable skill. However, there are few studies that have been conducted in this topic area. Our aim in this study was to find out the extent to which a group undergraduate students could construct and use diagrams to support/supplement the answers they wrote during a real course test. We were interested in whether they could adjust the kinds of diagrams they used to match the answers they were writing, and whether diagram use appeared to be beneficial. The option of using diagrams in test answers for extra points was included in the final test of an introductory educational psychology course. We analyzed the answers and diagrams produced by 26 students who agreed to the use of their test answers. Although 16 students produced at least one diagram, the rates of diagram inclusion in answers to the four questions were low (19-50%). However, the kinds of diagrams the students used varied between the questions, as did the functions the diagrams served, suggesting that generally the students were able to use diagrams in response to variations in question requirements. We also found that the qualities of completeness, integration, and correctness of diagrams related to the overall quality of their test answers. The answer quality scores of students who used a diagram were also significantly higher in two of the questions compared to those who did not, suggesting that the benefit of using diagrams may depend on the question requirements.

When is a scientist perceived to be credible? Trust and expertise in socio-scientific domains
Keywords: Cognitive Skills and Processes, Comprehension of Text and Graphics, Reading, Science and STEM
Presenting Author: Victoria Johnson, University of Minnesota, United States; **Co-Author:**Rina Harsch, University of Minnesota, United States; **Co-Author:**Panayiota Kendeou, University of Minnesota, United States

As information from high-credibility sources is more readily integrated and believed compared to information from low-credibility sources, who conveys information to the public can have significant impacts on public health and safety. However, less is known about the conditions under which people perceive the credibility of scientists within the emotionally and morally-charged socio-scientific domains of climate change and health science. Therefore, in this study we examined how expertise (high vs. low) and trust (high vs. low) influence perceived source credibility of scientists. Results indicated that complex interactions between expertise and trust determined the perceived credibility of scientists. These findings shed light on the impact of changing perceptions of trust and expertise of health scientists and climate scientists.

Session Q 15

26 August 2023 08:00 - 09:30
UOM_A08
Single Paper
Teaching and Teacher Education

Evolving Core Practices in Teacher Education

Keywords: Higher Education, Pre-service Teachers, Teacher Professional Development, Teaching Approaches
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Hege Hermansen, Norway

Comparing Core Practices and Entrustable Professional Activities in Teacher and Medical Education
Keywords: Higher Education, Pre-service Teachers, Teacher Professional Development, Teaching Approaches
Presenting Author: Marieke van der Schaaf, University Medical Center Utrecht / Utrecht University, Netherlands; **Co-Author:**Martine van Rijswijk, Utrecht University, Netherlands; **Co-Author:**Jan van Tartwijk, Utrecht University, Netherlands

In university undergraduate programs alignment between study goals with the development of (future) professional expertise (i.e., performance in tasks within a domain) that is strived for, is essential to stimulate students' development. This study aims to identify differences and similarities in how sets of task-units are

developed and positioned as learning objectives in curricula aimed at developing (future) professionals' expertise. Task-units in terms of core practices (CPs) and entrustable professional activities (EPAs) within 2 programmes for teacher education and 2 programmes for medical education were structured by means of delphi studies and stakeholder meetings. A research team with a mixed background in teacher and medical education qualitatively compared the task-units. Results show that the approaches and procedure to arrive at CPs and EPAs can be similar, while the content of both differ. Though the most important goal of CPs and EPAs is to stimulate (future) professionals' development, it is not clear how they impact students' development. Although CPs and EPAs may contribute to flexibilization of a curriculum, they are not automatically aligned to how professionals as learners develop in the context of the workplace.

At the Core of Core Practices: Conceptual Knowledge as an Enabling Factor for Successful Teaching
Keywords: Higher Education, Pre-service Teachers, Teacher Professional Development, Teaching Approaches
Presenting Author: Julia Kienzler, Universität Freiburg, Germany; **Co-Author:**Tim M. Steininger, University of Freiburg, Germany; **Co-Author:**Thamar Voss, University of Freiburg, Germany; **Co-Author:**Joerg Wittwer, University of Freiburg, Germany

Preparing teachers for the complex work of teaching is challenging. A promising approach is to support student teachers in acquiring core practices of teaching. To successfully execute core practices, an understanding of its conceptual aspects is fundamental. One way to promote such an understanding is providing student teachers with multiple examples. In this presentation, two experiments are reported that examined the effectiveness of exampled-based learning for acquiring conceptual knowledge associated with the core practices of classroom management and using learning objectives. Experiment 1 revealed that student teachers who actively compared examples were more successful in acquiring conceptual knowledge when they received instructional guidance. In addition, student teachers with more instructional guidance also experienced more productive and less unproductive mental load. Experiment 2 showed that a blocked format helped student teachers to generate new examples more effectively than an interleaved format and that student teachers who learned with subject-specific examples taken from their individual subjects rather than from random subjects generated new examples more successfully—especially when learning in an interleaved format. A mediation analysis showed that the subject-specific task value mediated the effect of subject-specific examples. Overall, the results indicate that the way example-based learning is designed matters for the acquisition of conceptual knowledge required to use core practices in the classroom. More concretely, student teachers benefit from example-based learning that is designed with sufficient instructional guidance, a blocked presentation, and subject-specific examples.

A Learning Trajectory for Preservice Science Teacher Eliciting and Interpreting Student Thinking
Keywords: Higher Education, Pre-service Teachers, Teacher Professional Development, Teaching Approaches
Presenting Author: Courtney Bell, Univeristy of Wisconsin, United States; **Co-Author:**Mark Olson, University of Wisconsin-Madison, United States

In the United States, COVID-19 exacerbated already large inequities in access to certified science teachers who are able to nurture students' science learning and social-emotional development. This study takes a design-based research approach to developing a preservice science teacher learning trajectory for the core teaching practice of *eliciting and interpreting student thinking*(EIST). To develop a provisional trajectory, data from eighteen Pre-Service Science Teachers (PSST) enrolled in a post-baccalaureate teacher education program were analyzed. Data include assignment artifacts from methods courses as well as records and observations of EIST enactment from student teaching instructional experiences. The hypothesized learning trajectory is characterized by changes in PSSTs perceptions regarding student ideas serving primarily as motivational supports for engagement toward PSST skill in incorporating student ideas toward cognitive engagement and learning goals. The study contributes to our understanding of teacher learning by articulating a learning trajectory we can use to 1) test our understanding of teacher learning in preservice and early career populations, 2) develop a conceptual bridge between literatures on teacher-student relationships and the teaching of science, 3) elaborate the interactions between teacher education pedagogies and teacher learning.

Dilemma Managing as a Core Practice in Teaching
Keywords: Higher Education, Pre-service Teachers, Teacher Professional Development, Teaching Approaches
Presenting Author: Roland Ebert-Glang, Albert-Ludwigs-University Freiburg, Germany; **Co-Author:**Ai Miyamoto, University of Freiburg, Germany; **Co-Author:**Matthias Nückles, University of Freiburg, Germany

Core practices such as lesson planning or classroom management require awareness of the effects and side effects of one's own pedagogical actions. Teachers must often choose between equally desirable goals, even if choosing one goal reduces the possibility of achieving another. Student teachers need to become aware of these contradictions and understand that not all aspects of good teaching can be realized at the same time. Since contradictions, role conflicts and ambiguity are among the main sources of stress for teachers, it is important that prospective teachers have a proper understanding of the dilemmatic nature of teaching. Against this background, we developed a questionnaire to measure preservice teachers' perceptions of dilemmatic situations in teaching contexts. We are currently running a study ($N = 53$ so far) to test (1) if student teachers perceive structurally dilemmatic situations as dilemmatic, (2) if they perceive them as solvable and (3) to what extent the scenarios seem realistic to them. (4) We also developed a questionnaire to measure tolerance for ambiguity, since studies in the medical field have shown, that tolerance for ambiguity is related to dealing with contradictory situations. Preliminary results suggest that the developed instruments have a decent reliability and that most scenarios were seen as realistic. Results generally indicate an insufficient understanding of the dilemmatic nature of teaching among preservice teachers. There are also indications that preservice teachers with a high tolerance for ambiguity view dilemmatic situations as less conflictual than preservice teachers with a lower tolerance for ambiguity.

Session Q 16

26 August 2023 08:00 - 09:30
UOM_A04
Single Paper
Culture, Morality, Religion and Education, Developmental Aspects of Instruction, Educational Policy and Systems

Education for Sustainable Development

Keywords: Citizenship Education, Competencies, Critical Thinking, Environmental Education, Ethics, School Effectiveness, Science Education, Sustainable Development, Teacher Efficacy
Interest group: SIG 13 - Moral and Democratic Education, SIG 18 - Educational Effectiveness and Improvement, SIG 25 - Educational Theory
Chairperson: Christine Edwards-Groves, Griffith University, Australia

Future-oriented science education building sustainability competencies
Keywords: Competencies, Environmental Education, Science Education, Sustainable Development
Presenting Author: Antti Laherto, University of Helsinki, Finland; **Co-Author:**Tapio Rasa, University of Helsinki, Finland; **Co-Author:**Lorenzo Miani, University of Bologna, Alma Mater Studiorum, Italy; **Co-Author:**Sibel Erduran, University of Oxford, United Kingdom; **Co-Author:**Olivia Levrini, University of Bologna, Italy

The aims and pedagogies of science education are evolving amid the global upheaval of all education due to the growing realisation of global sustainability crises. Education plays a key role in the endeavour towards the Sustainable Development Goals (SDGs). Our theoretical contribution here elaborates the role of science education research and practice in responding to these demands. In particular, we discuss how some prevailing and emerging currents of science education cohere with the sustainability competencies identified in the novel GreenComp framework launched by the European Union in 2022. The GreenComp framework comprises four interrelated areas of competencies that should be cultivated across all learning contexts to support the action-taking and transformations required by the global ecological crises. We argue that science education has a significant potential to contribute to all these areas: 'embodying sustainability values', 'embracing complexity in sustainability', 'envisioning sustainable futures' and 'acting for sustainability'. After discussing the affordances of current frameworks in science education for fostering each sustainability competency area, we argue that there is a need for a coherent approach to connect the areas and utilise the synergies between them. We propose that it can be done within the Future-Oriented Science Education (FOSE) approach, where students learn to envision sustainable futures and take action toward them through understanding the complexity of science-technology-society-environment relations and negotiating values underlying societal and technological development. We illustrate the suggestions by reviewing some examples of approaches for teaching

and learning developed in an EU project.

Education in the Anthropocene.
Keywords: Citizenship Education, Environmental Education, Ethics, Sustainable Development
Presenting Author: Denis Francesconi, University of Vienna, Austria

The term “Anthropocene” is a recent invention in the field of geological sciences and largely used in the environmental and sustainability sciences. It is also having a certain impact in the educational science. With this paper, I discuss the meaning of the Anthropocene for education. First, I discuss how the Anthropocene should be better understood as a cognitive era more than a geological one. Then, I present a techno-scientific approach to the Anthropocene, which poses relevant challenges to education. In particular, this approach looks at education as a way to increase planetary systems self-governance by adopting participatory computing, big data and social learning on a large scale. Finally, I conclude by remarking the fundamental role of education in improving planetary identity, awareness and responsibility for the cognitive human power, which is at the roots of the Anthropocene.

How teachers (can) make a difference for students’ development of sustainability competencies
Keywords: Environmental Education, School Effectiveness, Sustainable Development, Teacher Efficacy
Presenting Author: Katja Scharenberg, University of Education Freiburg, Germany; **Co-Author:**Eva-Maria Waltner, University of Education Freiburg, Germany; **Co-Author:**Christoph Mischo, University of Education Freiburg, Germany; **Co-Author:**Werner Rieß, PH Freiburg, Germany

Education for sustainable development (ESD) is anchored in many educational curricula in Germany as students’ corresponding competencies represent an important educational goal. However, empirical evidence regarding effects of ESD in schools is scarce. In our study, we examined how students’ sustainability competencies develop over the course of one school year. We proposed a theoretical framework model of sustainability competencies and focused on (a) students’ sustainability-related knowledge, (b) their affective-motivational beliefs and attitudes towards sustainability, as well as (c) their self-reported sustainability-related behavioral intentions. Based on a sample of *n*=1318 students in 79 classrooms at different secondary school tracks (Grades 5–8) in Baden-Wuerttemberg (Germany), students’ sustainability competencies in our longitudinal study were assessed at the beginning and at the end of the school year after the introduction of ESD as a guiding perspective for the new education plan. Descriptive analyses showed an increase in students’ sustainability-related knowledge, but their affective-motivational beliefs and attitudes towards sustainability decreased over the course of one school year. Multilevel analyses showed that, at individual level, prior learning requirements and ESD-related characteristics (participation in activities and general knowledge of sustainability) were the strongest predictors of students’ development. At classroom level, teachers’ attitudes towards ESD and their professional knowledge were significant predictors of students’ development. The higher the commonly shared value of ESD at school and the higher teachers’ self-efficacy towards ESD, the higher was students’ development of sustainability-related knowledge and their self-reported sustainability-related behavioral intentions. The significance of the findings for ESD in schools is discussed.

FridaysForFuture as its Pedagogical Function. An Enactive Network for Sustainable Development.
Keywords: Citizenship Education, Critical Thinking, Environmental Education, Sustainable Development
Presenting Author: Denis Francesconi, University of Vienna, Austria; **Co-Author:**Evi Agostini, University of Vienna, Austria

On 20 August 2018, the then 15 year-old student Greta Thunberg posted an image of herself outside Sweden’s parliament holding a cardboard sign reading “School strike for climate”. Soon after, the hashtags #FridaysForFuture (FFF) and #SchoolStrikeforClimate went viral and became a worldwide social movement. FFF represents today one of the most relevant social phenomena in the world and carries relevant implications for education.In this talk, we present data from a quali-quantitative content analysis on Greta Thunberg speeches and FFF’s documentation and social media’s entries. We show the main categories that emerged from our work. In particular, we first introduce FFF, its structure and narrative. We focus especially on the techno-scientific language often used by FFF and on the strong connection that FFF entertains with the scientific community. Then, we present FFF’s pedagogical function, which we describe as knowledge sharing and identity formation. We conclude by remarking that FFF seems to have a strong normative agency aimed not only at increasing environmental literacy in young students but also promoting a new planetary identity based on active and responsible activism and citizens.

Session Q 17

26 August 2023 08:00 - 09:30
UOM_A11
Single Paper
Motivational, Social and Affective Processes, Teaching and Teacher Education

Teachers' Well-being: Associations with Teacher- and Student-Related Variables

Keywords: Attitudes and Beliefs, Burnout, Classroom Assessment, Emotion and Affect, Engagement, In-service Teachers, Mixed-method Research, Quantitative Methods, Self-efficacy, Teacher Professional Development, Well-being
Interest group: SIG 08 - Motivation and Emotion, SIG 14 - Learning and Professional Development
Chairperson: Sheeza Mahak, Loughborough University, United Kingdom

Teachers’ epistemic theories and their relations to work-related wellbeing in five countries
Keywords: Attitudes and Beliefs, Burnout, Engagement, In-service Teachers
Presenting Author: Heidi Lammassaari, University of Helsinki, Finland; **Co-Author:**Lauri Hietajärvi, University of Helsinki, Finland; **Co-Author:**Rekar Abdulhamed, University of Helsinki, Finland; **Co-Author:**Markus Talvio, University of Helsinki, Finland; **Co-Author:**Kirsti Lonka, University of Helsinki, Finland

The current flow of misinformation in the media calls for teachers to develop their understanding of the nature, certainty and justification of knowledge, and what reliable sources are. These questions are all related to epistemic cognition. Epistemic cognition covers epistemic beliefs which constitute epistemic theories. Teachers’ epistemic cognition mediates how teachers act and how they perceive their work. Our previous study showed the relations between teachers' epistemic theories and their work-related wellbeing. In the present study, we looked at teachers’ (n = 1116) two previously confirmed epistemic theories, reflective collaborative theory and knowledge transmission theory, and how they were related to teachers’ work engagement and burnout symptoms in five European countries. We also looked at the variation across countries. Results showed that reflective-collaborative theory was related to higher work engagement and lower burnout symptoms whereas knowledge transmission theory was related to higher burnout symptoms. Moderations by country concerning work engagement indicated that the slope of reflective-collaborative theory was significantly steeper among participants from Latvia, Lithuania and Slovenia compared to the Italian sample which was congruent with the Spanish sample. In the case of burnout, the slope of knowledge transmission theory predicting burnout symptoms was steepest in the Lithuanian sample. This effect differed significantly for all other country samples, except the Latvian sample. We discuss how we were able to replicate our previous results in new contexts, and it appears that our instrument works in different countries in a similar way. The reasons for the results should be further explored.

Development and interplay in teachers’ self-regulation and well-being: an intervention study
Keywords: Mixed-method Research, Self-efficacy, Teacher Professional Development, Well-being
Presenting Author: Christine Wolfgramm, University of Teacher Education Zurich, Switzerland; **Co-Author:**Simone Berweger, Zurich University of Teacher Education, Switzerland; **Co-Author:**Zippora Bührer, Zurich University of Teacher Education, Switzerland; **Co-Author:**Andrea Keck Frei, Zürich University of Teacher Education, Switzerland; **Co-Author:**Christine Bieri Buschor, Zurich University of Teacher Education, Switzerland

In the context of increasing global societal challenges, issues facing the teaching profession have become even more acute. Self-regulation is a central personal resource in dealing with job demands and coping with stress. Professional development (PD) training programs, including coaching, have been established worldwide to support self-management and well-being, and to retain teachers in the profession by preventing burnout. This study examines the effects of a self-management training course followed by online coaching (OC) designed to support the transfer from the course to practice. The aim of the study, based on a

mixed methods research approach, was to 1) analyse the effects of the training on stress and 2) assess how teachers implemented self-regulation strategies and goals in their teaching practice. In addition, the interplay between self-regulation, professional self-efficacy, commitment, and stress was analysed. The sample consists of 273 primary teachers who participated in a three-week PD program. The study comprises five measurement points, including one during the COVID-19 pandemic. In addition, 15 coaches were interviewed. Analyses revealed that when the training was combined with OC, a benefit with respect to goal orientation and implementation was observed. Additionally, the results illustrated the importance of self-regulation in reducing stress, whereas self-efficacy was found to be related to work engagement. The analysis of the data collected in the pandemic revealed that the same contextual factors can be experienced as stressful or relieving, depending on teachers' personal conditions.

Student Engagement and Teacher Wellbeing: A Longitudinal Examination of Within-Person Effects
Keywords: Emotion and Affect, Engagement, Quantitative Methods, Well-being
Presenting Author: Aleksandra Huic, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia; **Co-Author:**Irena Buric, University of Zadar, Croatia; **Co-Author:**Izabela Soric, University of Zadar, Croatia

Although a lot is known about how teachers shape student motivation, less is known about how student motivation can shape teacher outcomes. In the present study we examined longitudinal associations between teacher perceptions of their students behavioral and emotional engagement and disaffection in class and their well-being, namely job satisfaction and emotional exhaustion. Specifically, we explored the relationship between student engagement/disaffection and teacher well-being indicators at the between-person level and at the within-person level (both concurrently and longitudinally) by testing the random-intercept cross lagged panel model (RI-CLPM). In total, 1141 secondary school teachers from 73 Croatian schools participated in the study and filled out questionnaires on four occasions separated by approximately 2.5-month intervals. Results at the between-person level showed that teachers who perceive their students as being more emotionally and behaviorally engaged, but less emotionally and behaviorally disaffected, tend to report higher levels of job satisfaction and lower levels of emotional exhaustion. At the within-person level, higher than expected levels of perceived student emotional engagement were concurrently associated with higher than expected levels of job satisfaction and lower than expected levels of emotional exhaustion. The opposite pattern was established for emotional and behavioral disaffection. Regarding the longitudinal spill-over effects, perceived emotional engagement and emotional and behavioral disaffection predicted teacher well-being over time, but not vice versa. These results highlight the importance of student motivation for shaping teacher occupational well-being and show that increasing student motivation can also benefit teachers. This work was supported by Croatian Science Foundation (Grant No. IP-2019-04-5472)

This Student Makes me Feel Burnt Out: Student-Specific Self-Efficacy, Classroom Demands, and Burnout
Keywords: Burnout, Classroom Assessment, Quantitative Methods, Self-efficacy
Presenting Author: Annika Koch, University of Bonn, Germany; **Co-Author:**Fani Lauermann, University of Bonn, Germany

Social-cognitive and resource theories suggest that teacher burnout is not a direct consequence of the demands teachers experience in the classroom, such as low student motivation and achievement, but rather the perceived inability to cope with these demands successfully. Numerous studies corroborate this assumption, as teaching self-efficacy has emerged as one of the key predictors and a protective factor against burnout. However, even though some studies suggest that teacher burnout may stem from negative experiences with individual students, rather than entire classes, no study to date has examined the associations between student-specific classroom demands, teaching self-efficacy, and burnout. To fill this gap, the present study used data from 60 teachers in language-focused classes (30 secondary school teachers and 30 adult education teachers in German-as-a-Second-Language classes) and their 610 students. Multilevel path analyses examined the within-class links between students' self-reported motivation and standardized performance (language proficiency), teacher-rated student engagement and ability, teachers' student-specific self-efficacy and enthusiasm for teaching individual students, and burnout (emotional exhaustion and depersonalization concerning individual students in the classroom). Negative within-class correlations between teacher burnout and students' motivation, teacher-rated engagement, and language proficiency indicated that these student characteristics can function as potential stressors. However, consistent with expectations, teachers' student-specific self-efficacy and enthusiasm were the strongest predictors of burnout. Not the existing classroom stressors per se but rather teachers' perceived capability to overcome these stressors in the classroom is critical for teachers' well-being. We replicated these findings in two settings: secondary-level and adult education language-focused classes.

Session Q 18

26 August 2023 08:00 - 09:30
AUTH_DC2
Single Paper
Cognitive Science, Developmental Aspects of Instruction, Learning and Social Interaction

Cognitive Development and Learning in Early Childhood

Keywords: Achievement, At-risk Students, Cognitive Development, Developmental Processes, Dialogic Pedagogy, Early Childhood Education, Educational Attainment, Engagement, Learning and Developmental Difficulties, Mathematics/Numeracy, Motivation, Reading, Teacher Professional Development
Interest group: SIG 05 - Learning and Development in Early Childhood
Chairperson: Ute Sproesser, Germany

Developmentally appropriate learning: the adaptation of Ages and Stages Questionnaire-3 in Greek
Keywords: At-risk Students, Developmental Processes, Early Childhood Education, Learning and Developmental Difficulties
Presenting Author: Maria Koushiou, University of Nicosia, Cyprus; **Co-Author:**Stavros Trakoshis, Unicaf University, Cyprus, Cyprus; **Co-Author:**Nina Michael, University of Cyprus, Cyprus; **Co-Author:**Fofi Constantinidou, University of Cyprus, Cyprus; **Co-Author:**Panayiota Dimitropoulou, University of Crete, Greece; **Co-Author:**Alexandra Klimentopoulou, Institute of Child Health, Greece; **Co-Author:**Antonis Jossif, "Paedi" Center for Specialized Pediatrics, Cyprus

Objective: The Ages and Stages Questionnaire – Third version (ASQ-3) is one of the most widely used developmental screening tests in young children. Despite its availability in many languages, there is no evidence of its psychometric properties in Greek. The present study aims to discuss the process of culturally adapting the ASQ-3 in Greek and examine its internal consistency, test-retest reliability and factor structure on a preliminary basis among Greek-Cypriot children aged nine to 66 months. Method: A total of 303 questionnaires were completed by parents for boys and girls representing two age categories, namely Toddlerhood (9-33 months) and Preschool (36-60 months). The tool's scale scores were analyzed per age category for each gender separately. Results: The subscales with the highest internal consistency based on the Chronbach's a (ranging from α =.71 to α= .88) are Communication and Gross Motor in the Toddlerhood age group for both genders and Fine Motor for male preschoolers. Regarding test-retest reliability, repeated mothers' completion of the questionnaire showed high and positive correlations in almost all domains. Exploratory factor analyses support the five-factor solution for questionnaires completed for male toddlers.Conclusions: Overall, results support the reliability and dimensionality of the ASQ-3 in Greek with improved psychometric properties shown for specific gender and age groups. Findings are discussed in light of the tool's potential contribution in developmentally appropriate learning in early childhood education and care.

No evidence that playing a number line game improves numerical skills: a randomised controlled trial
Keywords: Achievement, Early Childhood Education, Educational Attainment, Mathematics/Numeracy
Presenting Author: Ella James-Brabham, Loughborough University, United Kingdom; **Co-Author:**Tim Jay, Loughborough University, United Kingdom; **Co-Author:**Francesco Sella, Loughborough University, United Kingdom

Early numeracy skills predict mathematical outcomes at the end of school, as well as numerous life outcomes, including health, income, and quality of life. Therefore, it is important to support the development of numerical skills at the start of school, especially in children from a low socioeconomic background who are most at risk of falling behind. Some studies have highlighted the efficacy of linear number board games in improving early numerical skills, as well as the beneficial effect of counting forward and backwards. We designed a number board game which entailed placing number cards in order on a line either forward or

backwards while allowing children to play in small groups with minimal adult supervision. We evaluated the effectiveness of the game in a randomised control trial with four- to five-year-old children from schools located in low socioeconomic areas. Children were randomly allocated to one of three conditions: playing the number game only forward (n = 82), playing the number game forward and backwards (i.e., bidirectional condition;n= 82), or playing an alphabet game (n = 85). Children attended eight gameplay sessions across five weeks. Children's numerical skills and letter-sound knowledge were measured at baseline and post-test. Children improved between pre-test and post-test, but there was no significant effect of intervention condition. This indicates that neither the forward nor bidirectional version of the number game improved numeracy beyond regular teaching. Possible reasons for a lack of effectiveness and theoretical implications will be discussed.

Talk Matters in Shared Reading: The Role of Verbal Participation in Listening Comprehension
Keywords: Dialogic Pedagogy, Early Childhood Education, Engagement, Teacher Professional Development
Presenting Author: Janne Lepola, Univ. of Turku, Finland; **Co-Author:**Anu Kajamies, University of Turku, Finland; **Co-Author:**Molly Fuller Collins, Vanderbilt University, Department of Teaching and Learning, United States; **Co-Author:**Eero Laakkonen, University of Turku, Finland

The aim of the study was to examine children's listening comprehension during a two-semester-long intervention on dialogic reading. We were interested in children's responsiveness and explored the extent to which the development of listening comprehension was determined by initial listening comprehension and whether children's engagement and the amount and the level of verbal participation in shared reading contributed to their later listening comprehension. The role of the variability in the opportunities provided by teachers, such as closed and open-ended questions, was examined. A total of 60 five-year-old children participated in 15 story groups. Children's listening comprehension was evaluated in September and March. Teachers rated the children's behavioral and cognitive engagement in December. The children's verbal participation and the teachers' questions were video-recorded in February. A theoretical model involving direct and indirect pathways in the development of listening comprehension was proposed and analyzed by path modeling. Substantial stability in listening comprehension supported the direct pathway. In line with the hypothesis, the results also showed that the children's cognitive engagement and the amount of verbal participation were mediating the development of individual differences in their listening comprehension. Teachers' open-ended questions also contributed indirectly to listening comprehension via children's verbal participation. The findings highlight the benefits of children's active participation in discussions and talk-intensive reading aloud.

Long-term effects of the home literacy environment on reading development
Keywords: At-risk Students, Cognitive Development, Motivation, Reading
Presenting Author: Minna Torppa, University of Jyväskylä, Finland; **Co-Author:**Kati Vasalampi, University of Jyväskylä, Finland; **Co-Author:**Pekka Niemi, University of Turku, Finland; **Co-Author:**Kenneth Eklund, University of Jyväskylä, Finland

This study examines long-term associations (age 2-15) between literacy activities at home and long-term language and literacy development. Of the 198 Finnish participants, 106 have familial risk for dyslexia due to parental dyslexia. The results supported the HLE model in that teaching literacy at home predicted stronger emerging literacy skills, whereas shared book reading predicted vocabulary development and reading motivation. Both emerging literacy and vocabulary predicted reading development. Familial risk for dyslexia was a significant moderator regarding several paths; vocabulary, reading fluency, and shared reading were stronger predictors of reading comprehension among children with familial risk for dyslexia, whereas reading motivation was a stronger predictor of reading comprehension among adolescents with no familial risk. The findings underline the importance of shared reading and suggest a long-standing impact of shared reading on reading development both directly and through oral language development and reading motivation.

Session Q 19

26 August 2023 08:00 - 09:30
UOM_A13
Single Paper
Assessment and Evaluation, Teaching and Teacher Education

Teachers' Attitudes and Beliefs about Teaching and Assessment

Keywords: Attitudes and Beliefs, Classroom Assessment, Health-care Education, Higher Education, In-service Teachers, Inquiry Learning, Primary Education, Quantitative Methods, Teacher Professional Development, Tool Development
Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education
Chairperson: David Zamorano, Universidad de Deusto, Spain

Medical teachers' beliefs about teaching and assessment: effects on challenges and teaching quality
Keywords: Health-care Education, Higher Education, In-service Teachers, Teacher Professional Development
Presenting Author: Javier Fernández, Universidad de Leon, Spain; **Co-Author:**Ernesto Panadero, Universidad Deusto, Spain; **Co-Author:**Eneko Balerdi, Universidad de Deusto, Spain; **Co-Author:**Gaizka Camarón Alonso, Universidad de Deusto, Spain; **Co-Author:**Elena Auzmendi, Universidad de Deusto, Spain; **Co-Author:**Lucía Barrenetxea-Mínguez, University of Deusto, Spain

This study analyzes the beliefs about teaching and assessment of 41 novice medical teachers. We employed validated questionnaires, semi-structured interviews, and students' evaluation of teachers to measure teachers' beliefs, challenges, and teaching quality respectively. Firstly, teachers reported having a student-centered approach to teaching, especially older and more experienced teachers. Secondly, teachers reported that assessment has bigger effects on teaching, accountability of teaching and certification of learning than on students' learning. Thirdly, teachers reported to understand assessment as a tool for formative regulation over societal control. Additionally, teachers with a student-focused approach to teaching tended to not see assessment as a tool for societal control. Interview data of teachers' challenges and student evaluation of teaching scores will be analyzed by the time of the conference. Our results contribute to the knowledge of teachers' professional development in higher education, having implications universities and their professional development programmes to train and support novice teachers.

Development and validation of a questionnaire on teachers' conceptions of Assessment Literacy.
Keywords: Attitudes and Beliefs, Classroom Assessment, Teacher Professional Development, Tool Development
Presenting Author: Kitty Meijer, HU University of Applied Sciences Utrecht; Open University of the Netherlands, Netherlands; **Co-Author:**Liesbeth Baartman, University of Applied Sciences Utrecht, Netherlands; **Co-Author:**Marjan Vermeulen, Heerlen Open Universiteit, Netherlands; **Co-Author:**Elly de Bruijn, Hogeschool Utrecht / OU, Netherlands

Teachers' conceptions of assessment literacy (AL) influence the enactment of AL in practice. However, little attention has been paid to teachers' conceptions about contemporary concepts of AL. In this study we developed and validated a questionnaire based on the results of an explorative study on teachers' conceptions of assessment literacy in which we identified seven aspects of AL, namely continuously developing AL, conscientious decision-making, aligning, collaborating, discussing divergent perspectives, improving and innovating and coping with tensions in the assessment practice. Data from prior research was used to draft the initial items. The items were further refined by consulting critical peers. A large-scale study, with a response of 510 Dutch higher professional educational teachers, was conducted to explore latent variables and retain the best items per variable. The results show nine latent variables, represented with at least three items. The seven aspects of AL, as identified in the explorative study, are represented in these nine variables, however, two aspects were divided. Three items were removed. The internal consistency of the final scales was considered good, based on a Cronbach's alpha greater than 0,8. The final questionnaire, with nine scales and 44 items, can be a good instrument to investigate teachers' conceptions of AL.

Development of elementary teachers' beliefs about history and history teaching in a PD-programme
Keywords: Attitudes and Beliefs, Inquiry Learning, Primary Education, Teacher Professional Development
Presenting Author: Yolande Potjer, University of Amsterdam, Netherlands; **Co-Author:**Marjolein Dobber, Vrije Universiteit Amsterdam, Netherlands; **Co-**

Author: Carla Van Boxtel, University of Amsterdam, Netherlands

This paper explores how beliefs about the nature of history and pedagogical beliefs about teaching history of nine elementary school teachers developed over the course of a two-year professional development programme (PD) 'Historical reasoning in inquiry-based history lessons'. Studies about epistemological beliefs of history teachers describe three stances, or levels, in which teachers can think about the nature of history. Teachers with copier stance beliefs view history as identical to the past, teachers with borrower stance beliefs see history as a matter of opinion and teachers with criterialist stance beliefs view history as a construct based on domain-specific criteria. Nine elementary school teachers were interviewed before and after the PD programme and filled in the Beliefs about Learning and Teaching history-questionnaire before, during and after the programme. Findings indicate that elementary teachers participating in the PD programme all develop a more nuanced belief of history, even if there is not always a complete switch to a higher epistemological stance. Although participants' understanding of history is enriched, more naïve (copier and borrower) ideas remain besides more nuanced (criterialist) beliefs. Participants mention inquiry activities they worked on during the meetings, group discussions, modelling by the PD facilitator, searching for historical sources and designing and teaching inquiry-based lessons as the most important sources of professional growth. In the paper, resulting implications for research, PD programmes and elementary teacher education are highlighted.

Teachers Trust Scientific Evidence - Especially if it Confirms Their Beliefs
Keywords: Attitudes and Beliefs, In-service Teachers, Quantitative Methods, Teacher Professional Development
Presenting Author: Kirstin Schmidt, University of Education Karlsruhe, Germany; **Co-Author:**Tom Rosman, Leibniz Institute for Psychology (ZPID), Germany; **Co-Author:**Colin Cramer, Eberhard Karls Universität Tübingen, Germany; **Co-Author:**Kris-Stephen Besa, Universität Münster, Germany; **Co-Author:**Samuel Merk, PH Karlsruhe, Germany

Teachers should increasingly consider scientific evidence in their school practice to improve school and teaching quality as well as student learning. However, teachers often receive little training in research methods, which is why evaluating the veracity of evidence (e.g., by evaluating the study design) is challenging for them. Thus, they tend to evaluate how trustworthy a source appears. This so-called second-hand evaluation can be influenced by less objective criteria like characteristics of the source itself or teachers' characteristics such as their own beliefs. In a representative study with N = 414 teachers, we experimentally investigated the extent to which trust in knowledge claims from educational science is influenced by different sources (scientific vs. anecdotal) and topic-specific beliefs in terms of confirmation bias (information that fits one's beliefs is perceived as more validating). Contrary to previous findings, Bayesian random intercept models provide evidence for higher trust in scientific evidence than in anecdotal evidence (d = .81). However, at the same time, teachers are subject to confirmation bias: They show higher trust in knowledge claims that are consistent (rather than inconsistent) to their beliefs (d = .40). Based on these results, it might not be a general lack of trust in educational science that impedes an adequate engagement with evidence, but the selection criteria teachers use to evaluate scientific evidence, which are, in turn, influenced by their prior beliefs.

Session Q 20

26 August 2023 08:00 - 09:30
UOM_R02
Poster Presentation
Learning and Instructional Technology, Teaching and Teacher Education

Computer-assisted Learning in Students and Teachers

Keywords: Achievement, Artificial Intelligence, Comprehension of Text and Graphics, Computer-assisted Learning, Early Childhood Education, Educational Technologies, Higher Education, Instructional Design, Learning Analytics, Learning Strategies, Metacognition, Mixed-method Research, Multimedia Learning, Quantitative Methods, Secondary Education, Self-regulated Learning and Behaviour, Social Media, Teacher Professional Development, Teaching Approaches, Writing/Literacy
Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 27 - Online Measures of Learning Processes
Chairperson: Jule Krüger, University of Potsdam, Germany

Teachers' and students' acceptance of digital personalised learning: a case study in Flanders.
Keywords: Computer-assisted Learning, Educational Technologies, Learning Analytics, Mixed-method Research
Presenting Author: Ine Windey, KU Leuven, Belgium; **Co-Author:**Stefanie Vanbecelaere, KU Leuven, Belgium; **Co-Author:**Fien Depaepe, KU Leuven, Belgium

Digital Personalised Learning (DPL) tools offer many opportunities for classroom practices. Previous studies have revealed that teachers' perceptions on the ease of use and usefulness of DPL tools (Technology Acceptance Model – TAM; Venkatesh & Davis, 2000) have an influence on their intention to use DPL tools in the classroom and their actual use. However, it is not clear if teachers' perceptions on the use of these tools are aligned with students' perceptions. Hereto, a case study was conducted in a secondary school where several teachers recently adopted a new digital platform supporting DPL in their classroom. We were interested in both the (1) teachers' perceptions on the use of a DPL tool to support their classroom teaching, as well as the (2) students' perceptions regarding the use of the tool. A mixed-method approach, including focus group interviews, log data derived from the portal and a quantitative survey, was adopted to investigate both research questions. The results indicate that whereas teachers' perceptions are positive about the added value of using DPL tools, students' perceptions are somewhat moderate and they often prefer a rather traditional teaching method in class. There is, however, still a lot of potential to improve students' perceptions by increasing their use of the portal and by facilitating more personalisation.

Designing for human-AI collaboration: the effects of elaborateness and adaptability of explanations
Keywords: Artificial Intelligence, Computer-assisted Learning, Instructional Design, Quantitative Methods
Presenting Author: Lenka Schnaubert, University of Nottingham, United Kingdom; **Co-Author:**Lydia Harbarth, University of Duisburg-Essen, Germany; **Co-Author:**Cora Weisenberger, Universität Duisburg-Essen, Germany; **Co-Author:**Daniel Bodemer, University of Duisburg-Essen, Germany

Artificial intelligence (AI) is increasingly used in many areas such as the workplace and can support informed and optimized decision-making. Human-AI collaboration is more successful, when individuals develop an understanding of the AI system, which can be achieved by designing explicit instructions that provide details or reasons to make the system's functioning easy to understand. To study the effects of different types of instructional material, we conducted an online experiment ($N = 109$) varying the elaborateness and adaptability of explanations regarding the provided system's recommendations, and investigated the influence on cognitive load and perceived appropriateness of the explanations to understand the system (system causability). Results show that elaborate explanations can help users to understand the explanations provided by the system and may do so without adding excessive load. However, we did not find any effects of providing users with the opportunity to flexibly adapt the level of explanations. Additionally, correlation analyses show a negative relationship between cognitive load and AI system causability, which may point towards potential negative effects of cognitive load. Altogether, the further integration of AI systems in society warrants a close look into the processes of introducing AI and respective effects on the workforce. Research on learning and instruction has the means to support this process by providing insights into relevant cognitive processes and supporting the appropriate (instructional) design of human-computer interaction.

Training teachers to promote self-regulated learning with digital media in the classroom
Keywords: Computer-assisted Learning, Metacognition, Secondary Education, Teacher Professional Development
Presenting Author: Sabrina Reith, Technical University of Munich, Germany; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany

In order to support students to become self-regulated learners, teachers need the competence to foster the development of students' self-regulated learning. For this, teacher trainings can be an effective method (Moos & Ringdal, 2012). Hence, the aim of our study is to answer the research question to what extent a training on the promotion of SRL in the classroom can lead to increased performance among teachers regarding the promotion of SRL using digital media. In

more detail we are looking at the effects of the SRL training WITH input about digital media use vs. WITHOUT. Therefore, an experimental training study including pre- and posttests (four hours in total) was conducted. 43 teachers participated (EG = 24, CG = 19) in an online-training on the promotion of SRL. EG-participants had additional input on how to implement SRL with digital media while the input for CG-participants focused on general SRL implementation without explicit digital media use. Whereas we expect no treatment effects on general knowledge about strategy instruction (posttest), we assume that EG-participants report more use of digital media in the transfer task when describing the promotion for SRL in the classroom. As expected, the results show no difference between the treatment groups in the posttest ($t = .24$, $p = .82$). However, according to the qualitative analysis of the transfer task (currently in progress), preliminary analyses show distinctive frequencies in the expected direction. Comprehensive results will be presented and discussed in respect to implications for SRL trainings in this contribution.

Enhancing lasting learning by generative drawing through integration of retrieval practice
Keywords: Computer-assisted Learning, Instructional Design, Learning Strategies, Multimedia Learning
Presenting Author: Seokyoung Kim, Ruhr University Bochum, Institute of Educational Research, Germany; **Co-Author:**Detlev Leutner, University of Duisburg-Essen, Germany; **Co-Author:**Philipp Schmiemann, Biology Education Research and Learning Lab, University of Duisburg-Essen, Germany; **Co-Author:**Julian Roelle, Ruhr University Bochum, Germany

The present study aims to investigate how lasting learning by generative drawing can be enhanced through the integration of retrieval practice, which consolidates learners' mental representations. To integrate retrieval practice into the generative drawing procedure, the present study builds on recent studies that have incorporated retrieval practice into generative tasks by implementing the respective tasks in a closed-book format. In this format, learners cannot access the learning material while they perform the generative task and thus need to retrieve the knowledge that is needed to perform the generative task from memory. Specifically, in the present experiment, all learners first read an expository text and then are engaged in generative drawing. The generative drawing is either implemented in the established pure open-book format, in which learners can access the expository text on whose basis they are to construct their drawings all the time, or in a closed-then-open-book format, in which learners first must generate as much of their drawings as possible without access to the text. We hypothesize that because it integrates retrieval practice into generative drawing, the closed-then-open-book will yield better learning outcomes than the established open-book generative drawing after eight weeks. The data collection is not yet finished, but results will be available at the conference.

Learning to write in the digital age – differences between learning writing by hand or by computer
Keywords: Achievement, Computer-assisted Learning, Early Childhood Education, Writing/Literacy
Presenting Author: Vibeke Rønneberg, University of Stavanger, Norway; **Co-Author:**Wenke Mork Rogne, Volda University College, Norway; **Co-Author:**Eivor Finset Spilling, Volda University College, Norway; **Co-Author:**Per Henning Uppstad, Norwegian Reading Center, Norway; **Co-Author:**Siv M. Gamlem, Volda University College, Norway

Traditionally, children are first taught to write texts by handwriting. Now, however, technological advancements rapidly transform society, and in some educational settings, there is a move, toward students first learning to write by typing, without initial handwriting instruction. There is little research on the effects of writing by hand or typing on early writing outcomes, and the existing studies' findings are inconsistent (Wollscheid et al., 2016). We, therefore, investigated spelling ability, narrative text production, and handwriting after one year of school in three groups of first graders; one group learning to write by typing, one group learning to write with pencil and paper, and one group learning to write by hand and by typing in parallel. The study is a natural experiment, and participants are 572 Norwegian students learning to write by hand, typing on a computer, or a combination of both. We performed a linear mixed-effects analysis of the relationship between instructional modality and performance in spelling, narrative text production, and handwriting. Results suggest some differences in handwriting ability after one year of school, but no differences in spelling ability or ability to compose narrative texts. Implications are discussed. Wollscheid, S., Sjaastad, J., & Tømte, C. (2016). The impact of digital devices vs. Pen(cil) and paper on primary school students' writing skills - A research review. Computers and Education, 95, 19–35. https://doi.org/10.1016/j.compedu.2015.12.001

When to pose questions to promote learning from a science text?
Keywords: Comprehension of Text and Graphics, Computer-assisted Learning, Higher Education, Self-regulated Learning and Behaviour
Presenting Author: Ignacio Máñez, University of Valencia / Interdisciplinary Research Structure for Reading Research (ERI Lectura), Spain; **Co-Author:**Alba Rubio, University of Valencia / Interdisciplinary Research Structure for Reading Research (ERI Lectura), Spain; **Co-Author:**Marian Serrano-Mendizábal, University of Valencia / Interdisciplinary Research Structure for Reading (ERI Lectura), Spain; **Co-Author:**Eduardo Vidal-Abarca, Universidad de Valencia, Spain

This study is inspired by the paradigm of adjunct question research and aims at analyzing the question timing effect on students' processing and learning from science texts. Seventy-six freshmen studied two science texts answering ten adjunct questions, and then they were tested on learning five days afterward. Half of them answered the questions inserted into the text after reading the relevant information, whereas the other half completed all questions after reading the whole text. Students in both conditions could reread the text while answering the questions, so online behavioral data were recorded. Cognitive strategies (paraphrases, elaborations) while answering the questions were also collected. We hypothesized that inserted questions would enhance students' learning compared to post-reading questions, as inserted questions would assist students in inferential processes and discrimination of relevant information during the construction of the mental representation of the text. Results showed that students in inserted question condition read the text more carefully before reading the questions, discarded non-target information more effectively, and elaborated text ideas better than students in post-reading question condition. These processing differences may explain the higher post-test performance of students who answered inserted questions compared to students with post-reading questions.

The Complexities of Using Digital Social Networks in Teaching and Learning
Keywords: Higher Education, Mixed-method Research, Social Media, Teaching Approaches
Presenting Author: Enilda Romero-Hall, University of Tennessee-Knoxville, United States; **Co-Author:**Lina Gomez-Vasquez, The University of Tampa, United States; **Co-Author:**Laila Forstmane, University of Tampa, United States; **Co-Author:**Caldeira Ripine, University of Tampa, United States; **Co-Author:**Carolina Dias da Silva, University of Tampa, United States

Educational institutions at all levels (elementary, secondary, and higher education) are using digital social networks (DSN) to engage with stakeholders including learners, parents, their community, administrators, prospective students, and the general public. DSN are also being used by instructors as part of the learning experience or to engage with learners in less formal ways. In educational settings, there have been a decent number of investigations primarily related to how instructors and learners use DSN in their own learning experience. Researchers have also explored the use of specific DSN such as Twitter, Reddit, Instagram, Facebook, WhatsApp, and others by instructors in higher education. In this investigation, we wanted to gain a broad sense of the implementation of DSN for teaching and learning by instructors in higher education. We were particularly interested in examples of instructors' use of DSN in their courses, as well as, the usefulness and challenges of specific platforms for teaching and learning purposes. Last, our intent was to gain a sense of instructors' perspective on how DSN may have served them since the start of the COVID-19 pandemic.

Session Q 21

26 August 2023 08:00 - 09:30
UOM_R01
Poster Presentation
Motivational, Social and Affective Processes, Teaching and Teacher Education

Pre-service and Early Career Teachers: Motivational, Affective and Learning Processes

Keywords: Attitudes and Beliefs, Competencies, Curriculum Development, E-learning/ Online Learning, Emotion and Affect, Engagement, Health-care Education, In-service Teachers, Lifelong Learning, Mathematics/Numeracy, Personality, Pre-service Teachers, Problem-based Learning, Qualitative Methods,

Quantitative Methods, Teacher Professional Development, Well-being
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Henrik Lindqvist, Linköping University, Sweden

The impact of epistemic beliefs and emotions on student teachers' views about educational research
Keywords: Attitudes and Beliefs, Curriculum Development, Emotion and Affect, Pre-service Teachers
Presenting Author: Gillian Peiser, Liverpool John Moores University, United Kingdom

It is internationally recognised that the highest quality initial teacher education (ITE) is underpinned by practical workplace learning, educational research, and the dynamic between these two elements. However, extant studies tell us that student teachers (STs) prioritise experiential over theoretical learning and struggle to connect these. In the English context, the status of educational research is further threatened by shifting governance of ITE from universities to schools. This paper will report on a study that sought to yield insights to address the theory practice divide. In contrast to previous research focussing on the influence of contextual factors, the enquiry took a social-psychological perspective, investigating reasons for resonance and dissonance of research with STs. An online questionnaire studied relations between ST's beliefs about knowledge (epistemic beliefs) and feelings whilst engaging with research (epistemic emotions), and how these differed by demographic groups (gender, students following university-led and school-based ITE routes, students who studied arts and science type courses prior to ITE, primary and secondary STs, and postgraduate and undergraduate STs). Semi-structured interviews developed an in-depth understanding of trends emerging from the questionnaire. The findings revealed considerable influences of prior educational experiences, personality and orientation to learning, the cognitive load experienced by primary/secondary and undergraduate/ postgraduate students and a relationship between the nature of the research task and emotions.

Promoting preservice teachers´ reflection with training using the critical incident technique
Keywords: E-learning/ Online Learning, Pre-service Teachers, Qualitative Methods, Quantitative Methods
Presenting Author: Veronika Anselmann, University of Education Schwäbisch Gmünd, Germany

Teachers and learners are affected by uncertain times and teachers´ ability to reflect is seen as a key competence to deal with these challenges. In this study, the training, based on the framework of reflective practice for teacher education, and using the critical incident technique, took place. Thirty-three student teachers participated in the online training. A study with a pre-post design was conducted using online questionnaires and learning logs. The online questionnaire included validated and self-developed scales on educational satisfaction and reflection abilities. In the learning logs, the students were able to describe their reflection processes. Data were analysed using descriptive statistical analysis and t-tests, as well as qualitative data analysis. The results show that students significantly improved teaching reflection abilities after participation in the training. The results of the learning logs indicate that most of the student do experience different dimensions of reflection. The implications of our study concern the design of learning environments that allows students to reflect on concrete experiences.

Effects of epistemic emotions on pre-service teachers' MCK and MPCK
Keywords: Emotion and Affect, Mathematics/Numeracy, Pre-service Teachers, Teacher Professional Development
Presenting Author: Robin Göller, Leuphana University Lueneburg, Germany; **Co-Author:**Lars Jenßen, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Katja Eilerts, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Michael Besser, Leuphana Universität Lüneburg, Germany

In this contribution we analyse the effects of the epistemic emotions curiosity and frustration on pre-service teachers' mathematical content knowledge (MCK) and mathematical pedagogical content knowledge (MPCK). Data of 145 mathematics pre-service teachers were analysed by conducting a structural equation model with test scores of a MCK and a MPCK test as endogenous variables and as exogenous variables curiosity and frustration as well as the number of semesters at university, gender, high school grade point average, and the last school grades in the subjects mathematics and German as control variables. The results show significant effects of curiosity and frustration on mathematical content knowledge and a positive effect of curiosity on mathematics pedagogical content knowledge. In addition, regarding the desired development of professional knowledge in teacher training, the role of the number of semesters, which has a significant effect on MPCK but none on MCK, is discussed. The results underline the importance of emotions for the professional knowledge of pre-service teachers, which may need to be given more attention in the discussion on the development of professional competencies of (future) teachers.

The role of health literacy and occupational self-regulation for teacher trainees' well-being
Keywords: Health-care Education, Pre-service Teachers, Quantitative Methods, Well-being
Presenting Author: Kira Elena Weber, Leuphana University Lueneburg, Germany; **Co-Author:**Elena Hohensee, Leuphana Universität Lüneburg, Germany; **Co-Author:**Stephan Schiemann, Leuphana Universität Lüneburg, Germany

The personal health-related resources *health literacy* and *occupational self-regulation* have already been independently associated with well-being. However, there are few empirical findings on teacher trainees' health literacy with the subdimensions and none in relation with their well-being, whereas occupational self-regulation have already been empirically investigated in many studies, but has so far only been associated with indicators of occupational well-being. From a public health perspective, research of teacher trainees' well-being will profit from taking both research aspects into account. In this study, we analyzed data from 407 teacher trainees in Germany. Latent profile analysis confirmed the four occupational self-regulatory types (healthy-ambitious, unambitious, excessively ambitious and resigned) which differed significantly on the health literacy dimensions *self-regulation*, *self-control*, *self-perception*, *proactive approach to health*, *communication and cooperation* and *dealing with health information*. The health literacy dimensions *self-regulation* and *self-control* were mainly related to occupational self-regulation. Independently of each other, the self-regulatory types and the health literacy dimensions *self-regulation*, *self-control* and *proactive approach to health* predicted teacher trainees' well-being. If both constructs are considered together, the health literacy dimensions explain more variance for teacher trainees' well-being than the self-regulatory types. Research oriented and practical implications are discussed.

Complex requirement situations - learning opportunities for student teachers
Keywords: Competencies, Lifelong Learning, Problem-based Learning, Teacher Professional Development
Presenting Author: Liana Pirovino, Pädagogische Hochschule Zürich, Switzerland; **Co-Author:**Annelies Kreis, University of Teacher Education Lucerne (PH Luzern), Switzerland

A student teacher is confronted with resistant pupils in the classroom. His routines and experiential knowledge are not sufficient to deal with the situation directly, he feels overwhelmed and unable to address the issue. After the lesson, he reflects on what he could have done differently. With Helsper (2018, 2020) and his remarks on the four areas of tension and the obligation to legitimize, I assume that such Complex Requirement Situations (CRS) offer learning opportunities in the professional practice training of student teachers. The aim is to show how CRS can be characterized from the perspective of experts in school-based teacher education and extent to which learning takes place from them. The role of educators and reflection seem crucial in learning support (Reusser, 2005; Schön, 1987).
In the transdisciplinary project EdgeLab (Kreis & Pehlke-Milde, 2020), experts of school-based teacher education were questioned in guided interviews about complex situations for student teachers and about learning support. The interviews were analysed deductively according to Kuckartz (2022) and on the basis of specific theories and models (Keller-Schneider & Hericks, 2014; Collins, 2006; Kunter & Baumert, 2006). Initial results show that different types of complex requirement situations can be identified. Furthermore, CRS seem to be pivotal for the development of competence (Weinert, 2001) and professional development (Terhart, 2011) of student teachers. However, specific forms of learning support are needed to stimulate learning from complex requirement situations.

Personality traits as determinants of early-career teachers' occupational well-being
Keywords: Engagement, In-service Teachers, Personality, Well-being
Presenting Author: Josip Šabić, Institute for Social Research in Zagreb, Croatia; **Co-Author:**Dora Petrović, Institute for Social Research in Zagreb, Croatia

Teachers' early-career phase is a critical period for the formation of professional identity and decisions related to remaining in the profession. However, there is

a lack of research on the relationships between early-career teachers' personality and measures of their occupational well-being other than burnout (e.g. Kim, Jörg and Klassen, 2019; Cramer and Binder, 2015). The aim of this study was to examine the role of personality traits in explaining different aspects of teachers' well-being in the first 5 years of service. The data were collected as part of a pilot study for the project "The role of personality, motivation and socio-emotional competences in early-career teachers' occupational well-being (TeachWell)". Analyses were conducted on the data of 118 early-career teachers from 37 randomly selected elementary schools in Croatia who filled out the online questionnaire. The questionnaire contained measures of the Big Five personality traits (extraversion, agreeableness, conscientiousness, neuroticism and openness to experience; John and Srivastava, 1999) and different indicators of occupational well-being (satisfaction with work and teaching profession, planned persistence in the teaching profession, and teacher's work engagement). Preliminary findings, based on path analyses, indicate potential protective factors for early-career teachers' well-being. Teachers who were more conscientious, agreeable, extroverted, open and emotionally stable on average had more favourable results on indicators of occupational well-being. These results are in line with meta-analytical findings on prediction of psychological and subjective well-being from personality (Anglim et al., 2020).

Session Q 22

26 August 2023 08:00 - 09:30
UOM_R03
Poster Presentation
Higher Education, Instructional Design, Learning and Instructional Technology, Motivational, Social and Affective Processes, Teaching and Teacher Education

Self-regulated Learning and Behaviour

Keywords: Artificial Intelligence, Cooperative/Collaborative Learning, Engagement, Example-based Learning, Eye Tracking, Goal Orientations, Higher Education, Large-scale Assessment, Learning Analytics, Metacognition, Mixed-method Research, Motivation, Primary Education, Problem Solving, Quantitative Methods, Secondary Education, Self-regulated Learning and Behaviour, Social Sciences and Humanities
Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Jean-Marc Meunier, Université Paris 8, France

Effects of students' metacognition on teacher judgments, and school track decisions
Keywords: Large-scale Assessment, Metacognition, Primary Education, Social Sciences and Humanities
Presenting Author: Markus Neuenschwander, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland; **Co-Author:**Sog Yee Mok, University of Applied Sciences and Arts Northwestern Switzerland PH (FHNW), Switzerland; **Co-Author:**Kathrin Lockl, Leibniz Institute for Educational Trajectories (LIfBi), Germany

Teacher judgments of students' learning and achievement highly influence students' educational trajectories. Teachers do not only evaluate student achievement but also other student competences such as metacognition, especially declarative metacognitive knowledge. A multilevel path model was tested that declarative metacognitive knowledge affects teacher judgments of student achievement in mathematics and written language skills, teacher recommendation of the highest track school (i.e., gymnasium), and the transition to gymnasium after 4^{th} grade in Germany. The sample consisted of 5870 children from kindergarten cohort in the German National Educational Panel Study (NEPS). Declarative metacognitive knowledge, achievement in mathematics and written language skills as well as reasoning were measured using standardized tests. Teacher judgments and track recommendation were assessed by teacher ratings. Transition to gymnasium and students' socio-economic status (SES) were measured by parent data. Findings showed significant direct effects of metacognition on teacher judgment of achievement in mathematics and written language skills. There were also significant indirect effects of metacognition on school track recommendation and transition to gymnasium, mediated by teachers' judgments of achievement in mathematics and written language skills after controlling for achievement in mathematics and written language skills, SES, gender, and reasoning. Metacognition is not an official criterion in the selection to gymnasium in Germany, but it influences teachers' track recommendations and transition to gymnasium. Thus, metacognition is not only important for fostering high achievement, but it also plays a role for students' transition to gymnasium. Findings should be discussed in teacher training.

Analyzing Self-Regulated Learning of Secondary School Students
Keywords: Artificial Intelligence, Metacognition, Secondary Education, Self-regulated Learning and Behaviour
Presenting Author: Shruti Athavale, Technical University of Munich, Germany; **Co-Author:**Lyn Lim, Technical University of Munich, Germany; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany

Self-regulated learning (SRL) is related to better learning outcomes, especially for deep learning. The challenge of measuring and supporting SRL activities of learners, has been met by some researchers through educational process mining approaches, allowing a more fine-grained investigation of SRL processes through log data. Previous research has also outlined relationships between cognitive and metacognitive SRL activities with learning among higher education students and found improvements in learning outcomes. Data collection of the present study is currently in progress and will be collected and analyzed until January 2023. We focus on secondary school students and the assessment of their SRL strategies using a pre-post design within a AI-based digital learning environment. The aim of the study is investigating the relationship between metacognitive strategy knowledge, learning processes and learning outcome. Participating students learn about the topics of 'artificial intelligence' and 'school of the future' and have to write an essay in a digital learning environment within a 45-minute learning session. Results regarding a preliminary subset of five students indicate occurrence of learning gains in the domain knowledge and deep learning areas of essay and transfer test, with a cooccurrence of high metacognitive strategy knowledge. Post-hoc interviews reveal different SRL strategies used by secondary school students than higher education students and emphasize on the need to create effective online measurements of SRL activities for this age group. Implications lie within developing better metacognition skills among this age group by means of AI methods to enable better SRL strategies and enhance deep learning.

An in-depth analysis of students' approaches to transfer of trained self-regulated learning skills
Keywords: Example-based Learning, Eye Tracking, Problem Solving, Self-regulated Learning and Behaviour
Presenting Author: Jane Pieplenbosch, Utrecht University, Netherlands; **Co-Author:**Gesa van den Broek, Utrecht University, Netherlands; **Co-Author:**Vincent Hoogerheide, Utrecht University, Netherlands; **Co-Author:**Ewa Miedzobrodzka, Utrecht University, Netherlands; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

Self-assessment and task-selection skills are crucial for effective self-regulated learning of problem-solving tasks. However, many students struggle to accurately assess their performance and to select a suitable next learning task. Recent research shows that self-assessment (SA) and task-selection (TS) skills can be trained through video examples (SATS-training), in which those skills are demonstrated, and that this improves self-regulated learning outcomes. However, the limited research available suggests that students struggle to transfer these trained skills to other problem-solving contexts, and it remains unknown which factors facilitate or complicate transfer. Therefore, this study aims to uncover potential conditions and obstacles for successful transfer through an in-depth analysis of students' approaches to assessment and task-selection in new problem contexts. Thirty adolescents receive the SATS-training, complete a recall task of the trained self-assessment and task-selection procedure, and a vignette task, i.e., short descriptions of fictitious performance data on the trained (biology) problems and transfer problems in a new problem context (math) with a different number of problem-solving steps and/or database structure, based on which they have to select a next task. Process-tracing techniques (think-aloud protocols, eye tracking) are collected while students work on the vignettes. Key conditions for successful transfer will be explored by examining how well students can recall the trained procedure, recognize key features of the new context, and adapt the rule to the new problem context. The results will be available before the conference. These findings will inform future research on how to improve the transfer of trained self-regulated learning skills.

Not motivated - How regulation of learning builds up students' will to learn
Keywords: Cooperative/Collaborative Learning, Mixed-method Research, Motivation, Self-regulated Learning and Behaviour
Presenting Author: Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:**Tiina Susanna Törmänen, University of Oulu, Finland

Poor motivation for learning is increasingly recognized as a major challenge in education. Moreover, Covid-19 crisis put an extra burden to students' motivated learning. This poster presents a MotoR research project that aims to tackle this challenge by proposing that regulation of learning is a key mechanism for students to take charge of their own motivation. The main objective is to study how regulation during collaborative learning situations changes secondary school students' motivation in short and long term. The project implements a process-oriented approach and collects multichannel data from secondary school students through a two-step research design. First, the students' situational motivation and regulation of learning are followed. Focusing on regulation in authentic collaborative learning situations enables capturing how the students build up their motivation in interaction with their peers. Video, situated self-reports, stimulated recall interviews, and physiological data are collected. Second, the development of students' motivational trajectories in short and long term are tracked. This is done by relating situational motivation and regulation of learning with students' long-term motivational beliefs. Questionnaires and situated self-reports are administered. Together, the two-step research design accumulates multichannel data on motivation and regulation of learning on different time scales. The novelty of the project is that it combines data on different time and granularity levels to consider the relationship between regulation of learning and the development of motivation both on individual and group levels. It contributes to the research-based knowledge that is applicable in creating solutions for students' optimal learning motivation.

Sequential patterns between SRL processes and essay data in k-12 students.
Keywords: Artificial Intelligence, Learning Analytics, Secondary Education, Self-regulated Learning and Behaviour
Presenting Author: Inti Bistolfi, Radboud University, Netherlands; **Co-Author:**Susanne de Mooij, Radboud University, Netherlands; **Co-Author:**Joep van der Graaf, Radboud University, Netherlands; **Co-Author:**Inge Molenaar, Radboud University, Netherlands

When trying to help learners develop their self-regulated learning (SRL) skills it can be helpful to use data on their learning processes. This data could be used by Artificial Intelligence (AI) to support learners during their SRL. However, students' SRL processes are difficult to measure and the measurements that are used for this are not always possible to use in every environment. Trace data is a useful and unobtrusive measurement of students' SRL process that can be used by AI. Trace data is currently already used in some capacity, however more research is needed concerning this data to find patterns between trace data and SRL processes. This poster elaborates on the use of essay data, textual data gathered in essay writing tasks, and links it to SRL processes. If useful patterns can be discovered in the sequence of measured SRL processes using trace data and written essay data, we can fine tune the SRL process measured when writing the essay. Additionally, in this poster an analysis will be presented of the association between these sequential patterns of SRL processes measured with trace data and essay data and learning outcomes. Data collection for this research is planned for November/December 2022. Furthermore, a research plan will be presented introducing a supplementary measurement of SRL using Natural Language Processing (NLP) models.

Learning how to Learn through Student-Engaged Design (LhL-SED): Effects on Learning and Engagement
Keywords: Engagement, Mixed-method Research, Motivation, Self-regulated Learning and Behaviour
Presenting Author: Shannon King, George Mason University, United States; **Co-Author:**Haley McKeen, George Mason University, United States; **Co-Author:**Anastasia Kitsantas, George Mason University, United States; **Co-Author:**Beth Hosek, George Mason University, United States; **Co-Author:**Sahar Wahidi, George Mason University, United States; **Co-Author:**Asuka Nuwere, George Mason University, United States; **Co-Author:**Jerry Putt, George Mason University, United States; **Co-Author:**Roy Echeverria, George Mason University, United States; **Co-Author:**Jack Belkin, George Mason University, United States

The purpose of this study was to (1) determine the function and utility of a learning how to learn through student-engaged design course (LhL-SED) from the perspectives of teachers and students and (2) examine the effectiveness of this course on middle school (MS) students' engagement, task interest, self-efficacy for self-regulated learning (SRL), beliefs about intelligence, and mathematics performance as compared to a comparison group. Teachers (N = 9) who received a professional learning opportunity taught this course as part of the existing curriculum and participated in interviews approximately mid-way through the academic year regarding their perceptions of the course. Students in both the intervention (n = 111), and comparison group (n = 59), responded to four surveys regarding the targeted variables and participated in focus groups. Findings demonstrated that both teachers and students reported that the course fostered student collaboration and co-regulation. In terms of utility, students mentioned that the course helped them become self-directed learners, whereas teachers commented on students becoming responsible for their learning. Quantitative findings demonstrated that students enrolled in the LhL-SED reported higher levels of engagement, interest, and achievement compared to students who did not take this course. These findings show the importance of embedding LhL courses into the curriculum. They also demonstrate that students should have a choice and voice while engaging in projects to increase the likelihood of employing SRL strategies. Implications for practice are discussed.

The relation between the quality of university students' goal-setting and self-regulation.
Keywords: Goal Orientations, Higher Education, Quantitative Methods, Self-regulated Learning and Behaviour
Presenting Author: Heleen van Ravenswaaij, UMC Utrecht, Netherlands

Students are increasingly challenged to think about the professional they want to become and set their own goals accordingly. Goal-setting is an important factor in self-regulation and is linked to academic success and lifelong learning. The aim of the current study is therefore to investigate the relationship between goal-setting quality and graduate students' self-regulation and personal characteristics. Two data collection methods were combined: 1) an educational assignment in which all first-year life sciences students set a professional goal, and 2) a survey with SOL-Q and MSLQ self-regulation and personal characteristics questions, filled in by 145 students. Goal quality was coded based on the criteria of goal specificity, goal proximity, goal difficulty, and action planning. Students' goal quality varied. Goal difficulty was fair, but goal proximity and specificity appeared low. Although no direct relation between personal characteristics and self-regulation were found, it is expected that goal-quality can be explained to some extent by personal characteristics and self-regulation. This research study implies that more attention should be given in education to students' goal-setting skills. It furthermore provides insight in the relations between goal-setting quality and self-regulation and students' personal characteristics. These insights can help educators design interventions for specific groups of students in order to support their goal-setting skills development.

Session Q 23

26 August 2023 08:00 - 09:30
UOM_GYM
Roundtable
Instructional Design, Learning and Social Interaction, Motivational, Social and Affective Processes

Self-regulated Learning and Behaviour

Keywords: Cognitive Skills and Processes, Computer-supported Collaborative Learning, Higher Education, Instructional Design, Knowledge Construction, Misconceptions, Mixed-method Research, Motivation, Quantitative Methods, Self-concept, Self-regulated Learning and Behaviour
Interest group: SIG 06 - Instructional Design, SIG 08 - Motivation and Emotion, SIG 27 - Online Measures of Learning Processes
Chairperson: Risto Hotulainen, University of Helsinki, Finland

Instructional knowledge: On an empirical road towards conceptual clarification
Keywords: Instructional Design, Misconceptions, Mixed-method Research, Self-regulated Learning and Behaviour
Presenting Author: Morane Stevens, KU Leuven - University of Leuven, Belgium; **Co-Author:**Jan Elen, KU Leuven, Belgium

A substantial body of research indicates that students' knowledge of (components of) learning environments is oftentimes limited. Moreover, the nature of students' so-called 'instructional knowledge' can hinder their use of learning environment components, which in turn may negatively affect their learning outcomes. Clearly, in understanding the actual effectiveness, considering instructional knowledge is highly relevant. Empirical findings regarding instructional knowledge are less clear, resulting in inconclusive indications on how to consider this type of knowledge in designing learning environments. This contribution

argues that results are most likely distorted due to conceptual ambiguity with respect to instructional knowledge. Furthermore, we aim to tackle this issue and gain a better idea of the structure of this construct by comparing outcomes of two data gathering methods based on different descriptions of instructional knowledge. Some remaining methodological as well as conceptual thresholds serve as a base for further discussion.

An intraindividual study to how students regulate their motivation across a Bachelor course
Keywords: Higher Education, Motivation, Quantitative Methods, Self-regulated Learning and Behaviour
Presenting Author: Linda Zenger, University Utrecht, Netherlands; **Co-Author:**Barbara Flunger, Utrecht University, Netherlands; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

University students often lack motivation to study. This is problematic because motivation is a key predictor of academic achievement. Therefore, it is important to identify strategies to boost motivation. When students cannot rely on motivational support from others (e.g., teachers, peers), they can apply motivation regulation strategies to enhance their motivation. Motivation regulation has been found to be positively associated with effort and achievement, and negatively with procrastination and dropout intentions. Motivation regulation has mainly been considered as an aspect of Self-Regulated Learning and effective strategies have been identified based on SRL research, expectancy-value theory, and achievement goal theory. However, research on Self-Determination Theory has highlighted several strategies that can promote motivation which could also be used as self-motivating strategies, such as displaying patience and acknowledging frustration. Considering additional strategies could complement existing inventories and help to identify which strategies are most effective in improving academic outcomes. Additionally, most research on motivation regulation is cross-sectional and cannot uncover whether motivation regulation indeed drives academic outcomes. Specifically, prior research mostly studied motivation regulation as a trait-like characteristic that is stable across time and situations. However, motivation regulation may be situation-specific, implying that students may use different strategies when preparing an exam or writing an essay. Therefore, this study follows university students' motivation regulation during a course, considering several new motivation regulation strategies. The following research questions are studied: (1) How do students regulate their motivation over time and across tasks? (2) How is motivation regulation over time associated with academic outcomes?

Building bridges between theory and automated methods to study collaborative learning interactions
Keywords: Computer-supported Collaborative Learning, Knowledge Construction, Mixed-method Research, Self-regulated Learning and Behaviour
Presenting Author: Kateryna Zabolotna, University of Oulu, Finland, Finland; **Co-Author:**Jonna Malmberg, University of Oulu, Finland; **Co-Author:**Daniel Spikol, University of Copenhagen, Denmark

Speech is an integral part of collaborative learning (CL) interactions that contains both verbal (e.g., content) and non-verbal (e.g., voice pitch) indicators of how students construct knowledge together and regulate their learning process together. However, the research that would combine the investigation of *what* the students talk about with *how* they talk about it is still limited. This is partly due to the labor-intensive qualitative methods that are being used to look at the speech content. This study explores how traditional video coding of group interactions can be combined with automated speech analysis to investigate how students engage in collaborative knowledge construction (CKC) and what role regulated learning (RL) at group level plays in it. The participants were 21 secondary school students (6 female; 15 male) divided into groups of 2 to 3. A showcase of contrasting (most and least engaged in CL) collaborating groups is presented. The task was to build and program a robotic arm. Groups' interactions were video- and audio-recorded; additionally, physiological data (electrodermal activity (EDA)) was measured with Shimmer 3GSR sensors. CKC and RL events were identified from video data by using qualitative interaction analysis schema (Malmberg et al., 2015; Zabolotna et al., 2023). An automated speech recognition analysis method is developed to identify indicators of CKC and RL in speech content and to measure convergence between group members' voice fundamental frequency. The results provide visualizations of groups' CL interactions to show the events where CKC and RL co-occur and the between-learner speech convergence within them.

Frequencies and effects of academic comparisons in everyday life
Keywords: Cognitive Skills and Processes, Higher Education, Quantitative Methods, Self-concept
Presenting Author: Alexandra Petrak, University of Koblenz, Germany; **Co-Author:**Jens Möller, Kiel University, Germany; **Co-Author:**Friederike Helm, Kiel University, Germany; **Co-Author:**Fabian Wolff, Universität of Koblenz, Germany

Students compare their achievements in one domain with those of their peers (social comparison), own achievements over time (temporal comparisons), own achievements in other domains (dimensional comparison), or with a set criteria (criterial comparison). The present study is the first to examine all four comparison types in everyday life and the first to examine the consequences of these comparisons for domain-specific self-concepts. Over one week, n = 131 university students recorded their spontaneous comparisons concerning the academic domain. We found mostly social and more temporal than dimensional comparisons and effects of comparison type and direction: Downward social, temporal, and criterial comparisons showed positive effects; upward social, dimensional, and criterial comparisons showed negative effects on self-concepts.

Session R 1

26 August 2023 09:45 - 11:15
UOM_CH
Invited Symposium
Cognitive Science, Instructional Design, Learning and Instructional Technology

Understanding and alleviating difficulties in science learning: an intra-individual perspective

Keywords: Cognitive Development, Computer-assisted Learning, Conceptual Change, Eye Tracking, Game-based Learning, Instructional Design, Knowledge Construction, Mathematics/Numeracy, Misconceptions, Quantitative Methods, Science and STEM, Science Education, Teaching/Instructional Strategies
Interest group: SIG 03 - Conceptual Change
Chairperson: Garvin Brod, Germany
Discussant: Doug Lombardi, United States

Science learning (and, thus, teaching) is difficult. This is not primarily because scientific theories are complex, but because learners already have intuitive theories for understanding the phenomena covered by the scientific theories. To understand what difficulties learners face and how they can be alleviated, it is necessary to examine how individual learners go about revising their theories. Such an intra-individual perspective requires sophisticated experimental designs and new methods of analysis. The four papers in this symposium present studies that adopted this perspective. Using a Bayesian hierarchical diffusion model, Edelsbrunner and colleagues investigated how individuals' inhibitory abilities predicted their coping with interference between intuitive and scientific ideas. Using log-file data from a digital game, Kärki and colleagues examined how students transitioned from natural number to rational number reasoning, overcoming misconceptions such as "multiplication always makes bigger and division smaller". In a microgenetic intervention study, Bascandziev and colleagues examined how children revised their theory of matter and whether this depended on the children performing hands-on or thought experiments. In another microgenetic intervention study, Theobald and colleagues used Bayesian computational modeling and psychophysiological data to understand how making explicit predictions helped children revise misconceptions about water displacement. Finally, discussant Doug Lombardi will synthesize these findings and provide an outline for future research.

Does multiplication always make bigger? Exploring conceptual change in NanoRoboMath digital game
Presenting Author: Tomi Kärki, University of Turku, Finland; **Co-Author:**Minna Hannula-Sormunen, University of Turku, Department of Teacher Education, Finland; **Co-Author:**Hilma Halme, University of Turku, Department of Teacher Education, Finland; **Co-Author:**Erno Lehtinen, University of Turku, Finland; **Co-Author:**Jake McMullen, University of Turku, Finland

Many students face difficulties in learning rational numbers, since they tend to inappropriately apply natural number features in fraction and decimal tasks. Substantial conceptual change may be required to overcome these natural-number-biased (NNB) misconceptions. One example of NNB is a false belief that multiplication always makes bigger and division smaller. A digital game, NanoRoboMath, was designed to improve conceptual knowledge of rational numbers

and elicit conceptual change. Participants of this study were 103 seventh graders who played NanoRoboMath for five lessons. We explored indications of conceptual change through different game performance measures both at the group and at individual player levels. Results show that game performance predicts multiplicative operation knowledge with rational numbers. Furthermore, qualitative analysis of the individual player profiles show that the players were engaged in reasoning about the relation between rational number operations and magnitudes in versatile ways. Even though game performance varied considerably between the players, many indications of potential conceptual change could be detected.

Thought experiments as a tool for teaching scientific concepts
Presenting Author: Igor Bascandziev, Harvard Graduate School of Education, United States; **Co-Author:**Caren Walker, University of California, San Diego, United States; **Co-Author:**Elizabeth Bonawitz, Harvard Graduate School of Education, United States

The “child as a scientist” metaphor, suggesting that children learn as scientist do, has been a powerful idea that has shaped the research in child development and science education over many decades. The main focus of this broad research program has been to study the ways in which both children and scientists learn from data (i.e., from observations to theories and abstractions). However, as many have pointed out, both children and scientists also learn from thinking. A paradigm example of learning from thinking is learning from thought experiments. In the present study, we asked if young children could learn about the properties of matter by relying on thought experiments alone (i.e., without receiving any new data from the world). In a pre-training – training – post-training study, we tested 90 children (data collection is ongoing) who were assigned to three conditions: Baseline, Thought Experiments, and Real Experiments. We found that both children in the Real and the Thought Experiments conditions improved comparably well between pre- and post-training in comparison to the Baseline condition. These findings show that at least under some circumstances, observing new data from real experiments does not add any educational benefits over and above what can be learned from thought experiments.

Predicting promotes revision of misconceptions: Evidence from Bayesian models and pupillary surprise
Presenting Author: Garvin Brod, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Maria Theobald, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Joseph Colantonio, Harvard Graduate School of Education, United States; **Co-Author:**Igor Bascandziev, Harvard Graduate School of Education, United States; **Co-Author:**Elizabeth Bonawitz, Harvard Graduate School of Education, United States

The presented studies investigated the hypothesis that asking learners to generate a prediction before presenting conflicting evidence helps them to revise scientific misconceptions. In an exemplary study, we tested this hypothesis in children from 6-9 years of age (n = 94) and in the domain of water displacement. In the learning phase of a between-subject pretest–posttest–transfer test design, children saw pairs of spheres and had to generate predictions (prediction condition) or post-hoc expectancy ratings (postdiction condition) regarding which sphere displaces more water. We further leveraged behavioral and physiological data (i.e., pupillometry) from the learning phase to capture belief revision as it unfolds continuously, using Bayesian computationalmodeling. Children in the prediction condition exhibited a stronger improvement in performance from pretest to posttest and scored higher in the transfer test compared to children in the postdiction condition, indicating that generating predictions benefited the revision of misconceptions. At a computational level, this benefit could be captured as more optimal Bayesian learning. At a physiological level, this benefit was reflected in enhanced surprise about conflicting evidence, which was predictive of a successful revision of misconceptions. These results suggest that explicitly stating their beliefs helps learners to revise them.

What happens to conceptual knowledge during schooling? A Bayesian Hierarchical Diffusion Model
Presenting Author: Peter Edelsbrunner, ETH Zurich, Switzerland; **Co-Author:**Henrik Singmann, University College London, United Kingdom; **Co-Author:**Denis Dumas, University of Georgia, United States; **Co-Author:**Gidon Frischkorn, University of Zurich, Switzerland

Although conceptual change research traditionally has been concerned with modeling processes in individual learners, recent quantitative research in this area mostly models groups of learners and individual differences therein. We present a Bayesian hierarchical implementation of the Wiener diffusion model that is used to model both, processes within individuals and individual differences therein, in an integrated manner. Based on reaction time- and correctness-data from a statement-verification paradigm, we show that this approach is able to reveal individual differences in the process parameters of learners. We also provide new data showing that this model is able to capture effects of different kinds of inhibition on the ability to manage interference between intuitive and scientific conceptions that would remain hidden in more traditional models. We discuss implications of these findings and potentials as well as limitations of hierarchical diffusion modeling for research on conceptual change and other areas of education.

Session R 2

26 August 2023 09:45 - 11:15
AUTH_CH
Invited Symposium

Roles and nuances of theoretical work in different domains of educational research

Keywords: Argumentation, Conceptual Change, Cooperative/Collaborative Learning, Dialogic Pedagogy, Emotion and Affect, Informal Learning, Instructional Design, Knowledge Construction, Learning Approaches, Mixed-method Research, Morality and Moral Development, Quantitative Methods, Social Aspects of Learning and Teaching, Tool Development
Interest group: SIG 25 - Educational Theory
Chairperson: Nina Bonderup Dohn, University of Southern Denmark, Denmark
Organiser: Alexandra Nordström, University of Helsinki, Finland
Discussant: Giuseppe Ritella, Italy

The aim of the symposium is to trigger reflection on the different ways in which theoretical work is addressed in the different domains represented by EARLI SIGs. Each presentation provides different perspectives and addresses different dimensions of theoretical work, for example, reflections on how theory and theoretical work have been developing in the domain of the SIG, a discussion of current or historical theoretical challenges within the domain, illustrations of how theoretical development has been conducted in connection with empirical research within the domain, or other topics that address the significance of theory within the domain of the SIG. The presentations will provide different perspectives on educational theory, on its role in empirical research, and on the kind of challenges that researchers face when using and further developing theoretical notions and approaches.

Longitudinal social networks: Towards a better understanding of selection and influence mechanisms
Presenting Author: Jasperina Brouwer, University of Groningen, Netherlands; **Co-Author:**Dominik E. Froehlich, University of Vienna, Austria; **Co-Author:**Carlos de Matos Fernandes, University of Groningen, Netherlands; **Co-Author:**Marc Sarazin, University of Edinburgh, United Kingdom

Longitudinal social networks: Towards a better understanding of selection and influence mechanisms in social capital buildingKeywords: social capital, longitudinal, RSiena, influence, selection
This paper discusses how stochastic actor-based modelling (SAOM) – as an advanced methodological tool – allows researchers to (i) investigate complete longitudinal network data and, (ii) by doing so, inform and develop (existing) theories, particularly social capital theory. For example, this tool allows us to assess whether and how students are able to build social capital within their peer networks. Students have various relationships: among others, most notably friendships, advice seeking relations, and collaborations. These peer relationships enable the flow of different resources, such as course summaries, which are necessary for obtaining individual goals, such as passing exams. Through longitudinal social network analysis, we can study what drives network change over time and how the underlying selection and influence mechanisms contribute to social capital formation (affecting performance or attitude changes). Selection (initiating contacts) and social influence (doing what your peers do) are crucial social network mechanisms, but these mechanisms are overlooked in social capital theory. The longitudinal social network data and SAOM approach enables us to disentangle selection from influence (and vice versa) by modeling both processes separately. Overall, SAOM can provide a better understanding of network dynamics, thereby advancing social theories, such as the social capital theory.

Some criteria for good theories, illustrated with research on moral and democratic education
Presenting Author: Jean-Luc Patry, Paris-Lodron University Salzburg, Austria

Educational research aims at developing good theories. However, this endeavor is confronted with a great number of problems. In the presentation, some of the problems which are rarely discussed in the literature are addressed and illustrated using an example from moral and democratic education, namely the research programs on V*a*KE (Values *and* Knowledge Education), which is a constructivist teaching-learning tool that permits to combine values education with knowledge acquisition. After a short presentation of these research programs, the first criterion is discussed: What is science? – with a focus on transparency as a condition for control. Next, the concept of theory is defined, with the distinction of scientific and subjective theories. Then, the need for good theories is justified. The following criteria will be briefly discussed: The domain of viability and generalizability (which is a central aim of theories!); large-scale studies and the suppression of innovations; theory-multiplism and transdisciplinarity; the INUS concept (cause as an Insufficient but Nonredundant part of an Unnecessary but Sufficient condition for effect; Mackie, 1974); and Is and Ought. The conclusions deal with the need for research programs and with explicitly addressing issues that usually are implicitly alleged but are problematic, particularly in moral and democratic education.

Nothing so practical as a good theory? Studying hybridizations of learning
Presenting Author: Larike Bronkhorst, Utrecht University, Netherlands; **Co-Author:**Sanne Akkerman, Utrecht University, Netherlands

Where learning takes place, who learns and what should be learned is increasingly diverse and to some extent unpredictable in 21st century societies. While it is increasingly recognized that learners differ, that learning can extend across multiple contexts and that learning does not or should not have predefined outcomes, how research designs account for these premises varies. Research designs that, implicitly or not, constrain the who, what and where of learning overlook essential dynamics of learning, resulting in only a partial understanding of learning. This paper first outlines an argument for person-centered research designs that are responsive to individual learners and to learning wherever and whenever it manifests itself, while recognizing that researchers themselves are part of that design. This argument is supported by a mixed-method study conducted during a summer school offered by the university. This study focusses on children's (dis)continuity in their engagement with science in different contexts, and how this relates to their attitudes toward and understanding of science. The discussion highlights the nuanced understandings of learning that can be revealed and urges the field to be accountable for the inherently partial understandings of learning being generated.

Dialogic and Argumentative Theoretical Foundations for Designing Educational Technology
Presenting Author: Claire Polo, ECP Laboratory, France; **Co-Author:**Rupert Wegerif, University of Cambridge, United Kingdom

Today's instructional design is largely based on educational technology, either to address effective remote teaching or to improve face-to-face pedagogy. As Massive Online Open Courses (MOOC) are emblematic of the possibilities offered by the use of technology in education, they first developed through traditional, authoritative teaching mostly relying on magistral monologic lectures. Nevertheless, such practices are contrary to the now paradigmatic view in education research that considers learning as a tripod, socio-cognitivo-emotional process (Baker, Andriessen, Järvelä, 2013, Polo & Lund, 2021). Notably, literature in Computer-Supported Collaborative Learning (CSCL) discusses how to foster high-quality talk in educational interactions that would promote learning (e.g. Firer et al., 2021). Still, educational technology designers usually lack an explicit theory of dialogue that would orientate their work. Moreover, most theories that have been applied to educational technology did not take the distinctive nature and possibilities of technology into account. Such approach does not work because the tools that we use make a big difference to the kind of education that is possible. Our contribution aims at specifying a model of dialogue through technology easy to apply to instructional design (Wegerif & Major, to come), and clarifying how it takes into account the social and cognitive functions of emotions in collective reasoning (Polo et al., 2016). Such presentation of a 'dialogic' theory of education technology associated with attention to socioemotional dimensions of the cognitive processes of teaching and learning provides potential responses to key current challenges such as reacting to climate change or discriminating misinformation.

Session R 3

26 August 2023 09:45 - 11:15
AUTH_DC1
Symposium
Cognitive Science

High mathematics achievement: recent advances and challenges in understanding its mechanisms

Keywords: Achievement, Cognitive Skills and Processes, Gifted and Talented Students, Mathematics/Numeracy
Interest group:
Chairperson: Roland Grabner, University of Graz, Austria
Organiser: Bert De Smedt, KU LEUVEN, Belgium
Discussant: Michael Schneider, University of Trier, Germany

Recent reviews on talent development have highlighted that there is still much to learn about the nature of high mathematics achievement (Preckel et al., 2020). The current symposium brings together recent research on the cognitive and motivational characteristics of high mathematics achievement at different stages of education: from kindergarten up to mathematical experts. Study 1 examines which mathematics-specific and more general cognitive abilities in kindergarten are predictive of later high mathematics achievement in primary school. Study 2 focuses on (older) primary school children and investigated via growth curve modeling to which extent motivational aspects predict future mathematics learning. This study also examined the impact of specific classes for gifted children on these motivational aspects. Study 3 examines the cognitive and motivational characteristics of high achievement in advanced school mathematics in (older) secondary school students. Study 4 investigates the characteristics of mathematical experts in advanced domain-specific processing tasks that deal with memory and creativity. Theoretically, these contributions will clarify, at various points in development, the potential roles of cognitive and motivational factors, both domain-specific vs. domain-general, for high mathematics achievement. All presenters will discuss what these findings on high achievement can tell us on the broader spectrum of learners. From an educational point of view, it will be highlighted how these findings can help to foster and design effective learning environments for individuals with high mathematics achievement as well as for all learners.

Can cognitive abilities before the start of school predict later high mathematics achievement?
Presenting Author: Bert De Smedt, KU Leuven, Belgium; **Co-Author:**Merel Bakker, KU Leuven, Belgium; **Co-Author:**Joke Torbeyns, KU Leuven, Belgium; **Co-Author:**Lieven Verschaffel, KU Leuven, Belgium

Many studies have examined the cognitive characteristics of high mathematics achievement in adolescents and adults, but few have focused on primary school children and no study to date has investigated these characteristics even before the start of formal schooling. In a 5-year longitudinal study, we investigated 410 preschoolers' (aged 4-5 years) numerical abilities and more complex mathematical abilities as well as their general cognitive capacities. We followed these children into primary school and identified children with high (n = 31) and average (n = 114) mathematics achievement, via standardized math achievement tests in grade 1 (6-7 years) and grade 3 (8-9 years). We retrospectively analyzed to which extent there were differences in mathematics-specific skills and general cognitive abilities when these children were in preschool. Our findings revealed that already in preschool, high mathematics achievers performed significantly higher compared to average achievers with moderate to high effect sizes (*d*s = 0.63-1.63). A follow-up logistic regression revealed that numeral recognition ($p < .001$) and proportional reasoning ($p = .013$) in preschool emerged as the most critical and unique predictors of high mathematics achievement in primary school. The current data show that already before the start of primary school, high mathematics achievers show cognitive advantages in a variety of mathematics-specific and general cognitive abilities, with mathematics-specific abilities being the most critical and unique predictors of later excellence in mathematics.

The Role of Need for Cognition in Knowledge Acquisition in Mathematics in Regular and Gifted Classes
Presenting Author: Franzis Preckel, University of Trier, Germany; **Co-Author:**Julia Matthes, University of Trier, Germany

The personality trait of need for cognition (NFC) describes an individual's tendency to engage in and enjoy thinking. NFC can be understood as a general factor of investment traits that explain interindividual differences in the extent to which cognitive resources are invested in thinking and learning. NFC is positively related to knowledge and achievement in mathematics. However, findings for its relationship with knowledge *acquisition* in mathematics are lacking. We investigated whether NFC predicts knowledge gains in mathematics with and without controlling for students' prior knowledge and intelligence, and whether differences between different learning environments are evident in this regard. Longitudinal data were collected from *N*=922 high school students in grades 5-7 using Rasch-scaled mathematics knowledge tests, an intelligence test, and a NFC questionnaire (4 waves of measurement). Students attended either regular classes (RC; *n*=639; 44% female) or special classes for the gifted (GC;*n*=283; 34% female) at the highest track of the German secondary school system. Growth curve models and multigroup comparisons over class-type were used for analyses. Results indicate differences by learning environment. Knowledge gains in mathematics were predicted by NFC in gifted classes, and by prior knowledge and intelligence in regular classes. The findings can be embedded in previous research on NFC in learning and achievement contexts according to which the more complex tasks in gifted classes could lead to a stronger relationship between NFC and knowledge acquisition.

How can we characterise high-achieving students in advanced school mathematics?
Presenting Author: Simona Daguati, ETH Zurich, Switzerland; **Co-Author:**Elsbeth Stern, ETH Zurich, Switzerland

The aim of the current study was to characterise high-achievers in advanced school mathematics by studying differences in motivational and cognitive factors between high-achieving and under-achieving students as well as between subgroups within the group of high-achievers. Measures of general reasoning abilities, working memory functions, motivational aspects and math performance were applied. The 101 participants of the current study (Mage = 16.25 years) scored above average in reasoning ability in a sample of Gymnasium students. 67 students also scored above average in a curricular-valid mathematics test (high-achievers), while 34 students scored below average in this test (under-achievers). High-achievers and under-achievers did not differ regarding their interest in mathematics, while the high-achievers outperformed the under-achievers with respect to the working memory function of Storage-Processing. These results suggest that highly efficient working memory functions are required to excel in mathematics. On the other hand, the motivational variable of interest in mathematics came into play when comparing the subgroups of top scoring high-achievers and the subgroup of high-achievers with lower scores in mathematics. Overall, the results emphasised the importance of including different cognitive and motivational factors for explaining the preconditions for high-achievement in mathematics.

The role of mathematical expertise for memory and creativity
Presenting Author: Michaela A. Meier, Educational Neuroscience, Institute of Psychology, University of Graz, Austria; **Co-Author:**Stephan Vogel, University of Graz, Austria; **Co-Author:**Roland Grabner, University of Graz, Austria

While our knowledge about typical mathematical development has substantially increased in the past decades, we are still at the beginning of understanding the cognitive foundations of exceptional performance in mathematics. Previous studies have revealed that mathematics experts show a very similar ability profile as novices, in particular when matched for general cognitive ability. A central limitation of this research is the focus on rather basic mathematical tasks so that the role of the experts' knowledge base on more complex information processing is still unclear. This holds particularly true for memory and creativity, representing two types of processes that have not been investigated with respect to mathematical expertise. The aim of the present study was to fill this research gap. To this end, we compared 115 experts in mathematics with 109 gender, age, and educational level matched novices in their performance in (a) a newly developed mathematical memory task requiring encoding and recall of structured and unstructured information and (b) tasks drawing either on mathematical or on domain-general creativity. Consistent with other expertise domains, experts in mathematics (compared to novices) showed superior short-term memory capacity for complex domain-specific material when presented in a structured, meaningful way. Further, experts exhibited higher mathematical creativity than novices, but did not differ from them in their domain-general creativity. Both lines of findings demonstrate the importance of experts' knowledge base in processing domain-specific material and provide new insights into the characteristics of mathematical expertise.

Session R 4

26 August 2023 09:45 - 11:15
UOM_CR
Invited Symposium
Motivational, Social and Affective Processes

Situation- and Context-Specificity of Motivation and Emotions

Keywords: Emotion and Affect, Mixed-method Research, Motivation, Quantitative Methods
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Hanna Jarvenoja, University of Oulu, Finland
Chairperson: Hanna Gaspard, TU Dortmund University, Germany
Discussant: Hanke Korpershoek, University of Groningen, Netherlands
Discussant: Fani Lauermann, University of Bonn, Germany

Since decades, researchers have discussed the situation- and context-specificity of motivation and emotion. These discussions have experienced a new wave lately as novel methodological possibilities have emerged simultaneously with the development of versatile technologies. The developments have stimulated theoretical and empirical progress in motivation and emotion research in the field of education. This interest was boosted by the COVID-19 crisis, which highlighted the motivational and emotional challenges that students and teachers are facing, but also led to an increased use of digital technologies. The complexity of motivation and emotion simultaneously challenges the development and transfer of theories in the field as well as the methodologies and measures that are used. It is thus essential to promote constant dialogue between the theoretical and methodological developments. This symposium collects together different groups of researchers who have taken novel approaches to this theoretical-methodological association in their own research on different motivational and emotional phenomena in learning. Kaplan et al. propose a complex dynamic systems perspective to understand situated motivation and emotion. Bernacki et al. describe personalized learning as an approach that leverages digital technologies to improve motivation and learning. Lonka & Salmela-Aro summarizes their research on students' emotion and motivation by using various kinds of experience sampling methods using digital technology and advanced statistical analyses. Finally, Hascher discusses how research on well-being could benefit from a context-specific approach. The four presentations are followed by an interactive discussion stimulated by two discussants.

A Complex Dynamic Systems Perspective on Situated Motivation and Emotion: Implications for Research
Presenting Author: Avi Kaplan, Temple University, United States; **Co-Author:**Joseph Eisman, Temple University, United States; **Co-Author:**Joanna Garner, Old Dominion University, United States; **Co-Author:**Stephen Whitney, University of Missouri/Columbia, United States

While the primary purpose of motivation theory and research is to explain why people act the way they do, most motivational research does not focus on understanding individuals' actions in particular situations. Instead, motivational research has tended to focus on investigating the nomological networks of motivational constructs. In this presentation, we argue that construct-focused research cannot explain individuals' situated actions due to three main reasons: (1) the multitude of personal, interpersonal, cultural, contextual, and situational factors and processes involved in situated actions; (2) the complex interplay among these factors; and (3) the manifestation of these processes at the unit-of-analysis of the "person-in-situation." We follow to describe a complex dynamic system theoretical model that incorporates these assumptions about situated motivation and action—the Dynamic Systems Model of Role Identity (DSMRI). We then provide an illustrative example of a research project that employs the DSMRI to investigate the situated motivation, emotions, and actions of social studies teachers while they facilitate classroom discussions.

Student- and Task-Specific Factors Influence How Personalized Math Learning Affects Outcomes
Presenting Author: Matthew Bernacki, University of North Carolina at Chapel Hill, United States; **Co-Author:**Candace Walkington, Southern Methodist

University, United States; **Co-Author:**Vanessa W. Vongkulluksn, University of Nevada Las Vegas, United States

Personalized learning (PL) is an increasingly popular method of instruction that involves the collection or access of information about a learner and the adaptation of instruction to improve their ability to achieve a learning goal. However, implementations of personalized learning are highly context-dependent, and designs are tailored to accommodate the experiences, abilities and interests of learners, and the academic contexts and domains in which the PL designs are employed. Thereafter, the ways that personalized learning designs can accommodate learners who may vary in the characteristics to which the PL is responsive can themselves vary (e.g., match to students' prior knowledge vs. interests). Such complex learner by context interactions and variation in deployment of instruction from one learner to the next have implications for the ways that instruction can influence key learning outcomes such as interest and learning in academic domains like mathematics. In this presentation, we consider an extended line of inquiry into the personalization of math instruction to students' out-of-school interests and use a theory of *context personalization* (Walkington & Bernacki, 2014) to consider the ways that PL designs may differentially impact motivation and learning for individual students.

Using Contextual and Situational Methodologies to Investigate Student Emotion and Motivation
Presenting Author: Kirsti Lonka, University of Helsinki, Finland; **Co-Author:**Katariina Salmela-Aro, Helsinki University, Finland

The present paper summarizes our research on students' emotion and motivation by using various kinds of Experience Sampling Methods (ESM; Csikszentmihalyi & Larson, 1987; measuring flow). Such methods are similar to Ecological Momentary Assessment (EMA; e.g., Reis & Gable, 2000), and both provide ways of assessing *participants' contextual activities, events, and personal experiences.* Currently, various smartphone technologies capture such momentary experiences (e.g., Ketonen et al., 2019; 2022; Maksniemi et al., 2022). Usually, we ask participants several times a day about what they are doing, about their emotional experiences, their level of challenge/sense of competence. This methodology records the experiences *in situ* – when they are occurring. We looked at the daily dynamics of university students' and adolescents' activities inside and outside higher education and school, the related motivational and emotional experiences, and well-being. To capture situation-specific engagement and emotions, we assessed individual experiences of students in real-life settings with multiple assessments. With the long-term support by Academy of Finland since 2007, we aimed at revealing the effect of situational determinants, enhancing contextual closeness and reducing recall bias: unlike trait-like assessments that may reflect overall cognitive beliefs about emotions (see Goetz et al., 2013) we could capture the actual experiences, examining how emotions, task-value-expectations and engagement fluctuate over time. Recently, we also added the physiological measures in this picture and were able to challenge many common-sense understandings about the role of technology in the motivation and well-being of youth.

How Can Well-Being Research in Education Benefit from a Context-Specific Approach?
Presenting Author: Tina Hascher, University of Bern, Institute of Educational Science, Switzerland

Well-being in education has received increased research attention during the last years. While there is widespread agreement that well-being is beneficial for student and teacher functioning in schools, heterogeneity and dissents about the construct of well-being may hamper its sound scientific development and practical relevance. Two reasons for this divergence can be discussed: First, well-being is used as an umbrella term that includes a wide array of psychological constructs such as (absence of) stress, burnout, and negative emotions, or satisfaction, motivation, and resilience. This blurs the definition of the construct of well-being and consequently weakens the role and impact of evidence-based knowledge that would be needed to improve practice. Second, well-being is often strongly connected to the individual but only loosely associated with the context in which the individual exists. Studies examining the prevalence and causes of well-being typically use general instruments that fail to take into account that the nature of well-being may vary across contexts. This context-unspecific approach may also contribute to a poorly defined construct that fail to unfold its full potential for research and practice. In my presentation, I will argue how well-being research could benefit from a more nuanced, context-specific approach that considers both contextual and individual factors that contribute to well-being. My outlines are premised on the assumption that further research and practice that aims at fostering well-being in education suffer from the ambiguous and context-unspecific use of the construct of well-being.

Session R 5

26 August 2023 09:45 - 11:15
UOM_A02
Symposium
Higher Education

What is a PhD worth beyond academia? Impact of the disciplinary field

Keywords: Competencies, Doctoral Education, Higher Education, Qualitative Methods, Quantitative Methods, Researcher Education, Social Development, Social Interaction
Interest group: SIG 24 - Researcher Education and Careers
Chairperson: Isabelle Skakni, Switzerland
Discussant: Montserrat Castelló, Ramon Llull University, Spain

PhD holders are increasingly working in sectors beyond academia, a fact universities worldwide are beginning to recognise. In turn, the nature and purpose of a PhD degree is shifting, evidenced by increased attention to doctoral training and a focus on PhD holders' careers in policy and research. However, preparation for careers beyond academia remains uneven across disciplines. For instance, it is not uncommon in STEM fields for doctoral candidates to enrol in PhD programmes in partnership with companies or in internships in industry, facilitating connections with industry employers. In contrast, doctoral candidates in the humanities and social sciences (HSS) tend to have fewer opportunities to engage with non-academic sectors during their doctorate. Moreover, the labour market does not offer the same opportunities depending on one's disciplinary background: A PhD in STEM tends to be valued more positively outside academia than a PhD in HSS. However, little is known about how PhD holders are perceived beyond academia. This symposium provides further insight into the PhD degree's value beyond academia in four countries. The first paper explores how PhD holders working beyond academia may act as knowledge brokers in the Spanish context. The second paper examines employers' views of the PhD benefit for their organisations, focusing on work sectors and PhD fields in Belgium. The third paper contrasts PhD holders' and employers' views of the PhD degree's value, with attention to differences across disciplines in Switzerland. The fourth paper focuses on stereotypes associated with PhD holders in France based on disciplinary fields.

Ph.D. holders beyond academia as knowledge brokers: Disciplinary-based differences
Presenting Author: Marina García-Morante, Blanquerna, Universitat Ramon Llull, Spain; **Co-Author:**Montserrat Castelló, Ramon Llull University, Spain; **Co-Author:**Anna Sala Bubaré, Ramon Llull University, Spain

An increasing number of Ph.D. holders develop their professional careers beyond academia. They are highly-skilled workers valued in knowledge economies, potentially able to straighten connections within innovation ecosystems. However, little is known about the relationships, if any, early career researchers following non-traditional academic careers maintain with academia. In this study, we aim to explore to what extent early career researchers from different disciplinary backgrounds maintain relationships with academia, and the motives and prospects surrounding these relations. We looked at identity trajectories (McAlpine, 2012) of 39 Spanish researchers (19 women and 20 men) across disciplines and professional sectors (NGOs, public and private companies). Qualitative data from interviews have been categorized through thematic content analysis. Results showed three types of trajectories: null collaborators, hybrid collaborators, and research partners. Moreover, results reveal the interaction between personal, disciplinary, and structural factors, and how they mediate early researchers' trajectories. PhDs holders from STEM differ from those in Social Sciences in maintaining sustainable relationships with academia. The study has several implications for multiple stakeholders in research and development since it reveals diverse ways to straighten innovation connections and inputs to promote them.

What is a doctorate worth for non-academic employers?
Presenting Author: Neda Bebiroglu, Observatory of Research and Scientific Careers-F.R.S.-FNRS, Belgium

This paper tries to uncover the added value of the doctorate for non-academic employers. In line with the knowledge-based view of organisations, we conceptualize the perception of the added value of the doctorate as characterized by a vector of organisation-related and employer-related factors that have been pointed to as potential determinants of the demand of doctorate holders in the non-academic sectors. Using data from a survey of 614 Belgian non-academic employers, we analyse different factors impacting (1) the perception of the added value for non-academic employers and (2) added value of the doctorate for R&D related activities. This study offers insight into the value of the doctorate for non-academic sectors by considering the role of multiple factors as well as the connections between them. It also sheds light on how to increase the added value of doctorate outside of academia.

Valuing the PhD degree in non-academic workplaces: PhD holders' and employers' perceptions
Presenting Author: Michaël Parmentier, University of Applied Sciences and Arts Western Switzerland, Switzerland; **Co-Author:**Nata Kereselize, University of Applied Sciences and Arts Western Switzerland, Switzerland; **Co-Author:**Laurence Fedrigo, University of Lausanne, Switzerland; **Co-Author:**Kelsey Inouye, University of Oxford, United Kingdom; **Co-Author:**Isabelle Skakni, University of Applied Sciences and Arts Western Switzerland, Switzerland

This paper emerges from an ongoing study on PhD holders pursuing careers beyond academia in Switzerland. Drawing on concepts of cross-occupational mobility and skills transferability, we conducted semi-structured interviews with PhD holders (n=32) and employers (n=9) from the private, public/para-public and so-called "third space" sectors. We intended to contrast PhD holders and employers' perceptions of a PhD degree's value with a focus on variation across disciplinary fields. The preliminary results suggest that PhD holders from STEM fields work mostly in the private sector, tend to report that their positions align with their subject matter knowledge and technical skillset and are often recruited for a very specific expertise that their employer seeks. In contrast, PhD holders from humanities and social sciences (HSS) fields generally work in the public/par-public and third space sectors where employers less understand a PhD degree's value. They tend to report that the nature of their work is not always aligned with the particular knowledge and skills acquired during their doctoral years, and that the main asset of their PhD is the credibility and legitimacy it confers on them in their workplace. However, regardless of the disciplinary field or employment sector, the PhD degree appears rarely to be a formal hiring criterion and employers hardly recognise it in terms of seniority and salary.

How is holding a PhD perceived outside academia? Stereotyping of PhD holders in the French context
Presenting Author: Alexandre Bran, Laboratory of Interdisciplinary studies on the Doctorate, Adoc Talent Management, France; **Co-Author:**Nicolas Lopes, Adoc Talent Management, France; **Co-Author:**Eric Bonetto, Adoc Talent Management, France

Studies show that PhD holders perceive they are subjected to negative stereotypes, for instance by reporting to be considered snobbish (e.g., Suomi et al., 2020). However, the actual prevalence of these stereotypes and their variations depending on factors such as gender or disciplinary field have not been investigated yet. In this paper, we present a study conducted in France with the aim of examining the stereotypes held by the French population, and the perceptions of these stereotypes held by PhD candidates and PhD holders. To do so, we draw on the integrative model of social evaluation (Abele et al., 2021), according to which stereotypes can be captured through four main dimensions: ability, assertiveness, friendliness, and morality. The data collection method combined a qualitative free association task and an experimental social evaluation task that enabled us to also consider the influence of disciplinary field and gender. Results suggest that spontaneous stereotypes of PhD holders in the French population are mostly positive and focus on their ability and assertiveness. However, PhD candidates and PhD holders had a more negative perception of these stereotypes on all dimensions. We also observed variations depending on gender and research field, with women being evaluated higher on the ability and assertiveness dimension than men, and PhD holders in STEM fields being evaluated higher on the ability dimension than PhD holders in Humanities and Social sciences.

Session R 6

26 August 2023 09:45 - 11:15
AUTH_T002
Symposium
Teaching and Teacher Education

Evidence-informed reasoning of pre-service teachers

Keywords: Attitudes and Beliefs, Critical Thinking, Educational Policy, Ethics, Misconceptions, Pre-service Teachers, Qualitative Methods, Quantitative Methods, Reasoning, Social Sciences and Humanities, Synergies between Learning / Teaching and Research
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Martijn Meeter, Vrije Universiteit Amsterdam, Netherlands
Organiser: Izaak Dekker, Amsterdam University of Applied Sciences (AUAS), Netherlands
Discussant: Ingo Kollar, University of Augsburg, Germany

In order to improve the quality of education, educational policies across countries stimulate evidence-based or evidence-informed education. These concepts differ in nuances and in how 'strict' they are perceived but share two ambitions. To improve the degree to which educational practitioners apply (findings from) educational research, and the degree to which educational researchers provide solid evidence for educational practice. The ambitions already imply that these interactions are not a commonplace, which their reception in both educational practice and research seems to confirm. This symposium brings together four papers about what might hinder or further these two ambitions. The first three papers will describe the degree to which pre-service teachers apply findings from educational research, while the fourth paper addresses the degree to which educational research provides useful evidence. Paper one presents the findings from two studies into the beliefs of pre-service teachers about the usefulness of educational science. The second paper describes the degree to which the presentation of scientific evidence, and its perceived pertinence and potency, can change the beliefs of pre-service teachers based on two experimental studies. Our third paper presents the outcomes of a scenario-study, which explored the degree to which pre-service teachers use scientific evidence in their everyday reasoning. Finally, the fourth paper categorizes and evaluates the criticisms against evidence-based and -informed education. Based on the criticism, this paper proposes adaptations of educational research that could make educational research more credible and informative for practice.

Not useful to inform teaching? Pre-service teachers' skeptical beliefs about education science
Presenting Author: Thamar Voss, University of Freiburg, Germany

A goal of teacher education is to promote future teachers' orientation towards the best available knowledge. However, a lack of evidence-based thinking among teachers is often observed. Teacher beliefs are assumed to act as facilitators or barriers to evidence-based thinking. In two studies, we investigated German pre-service teachers' beliefs about education science and their consequences and potential sources. On average, pre-service teachers judged general education science as less important for successful teaching than their subject didactics and as less complex than their subject disciplines. Furthermore, skeptical beliefs were associated with a lower engagement in education science courses. Lastly, results showed that the "soft" research methods typical of education science and unrealistic expectations about the education science curriculum might contribute to this devaluation.

The scientific impotence excuse in education: Disentangling potency and pertinence assessments
Presenting Author: Holger Futterleib, University of Erfurt, Germany; **Co-Author:**Eva Thomm, University of Erfurt, Germany; **Co-Author:**Johannes Bauer, University of Erfurt, Germany

When pre-service teachers face scientific evidence that contradicts their beliefs, they may attempt to maintain their personal beliefs instead of revising them. For this purpose, pre-service teachers resort to devaluation tendencies such as doubting the potency of science or having a decreased preference for scientific sources. By engaging in the scientific impotence excuse (SIE), individuals run the risk not only to uphold flawed beliefs but also to depreciate educational research as reliable source of knowledge. In two studies, we (a) replicated findings on the SIE in education and (b) disentangled the effects on the potency (i.e. epistemic capacity) and pertinence (i.e. normative ascription of relevant competence) of science to investigate educational topics to understand SIE-related devaluation more comprehensively. Both studies followed a 2 x 2 mixed experimental design: Pre-service teachers assessed their belief about the effectiveness of grade retention before and after reading either confirming or disconfirming scientific evidence concerning this topic. The direct replication (Study 1; N = 147

pre-service teachers) demonstrated the expected devaluation tendencies when facing belief-evidence conflicts. Hence, participants devalued the potency of science and indicated a declining preference for scientific sources. In contrast, in the follow-up study (Study 2; N = 152 pre-service teachers) these systematic devaluations of science diminished when disentangling the facets of potency and pertinence. Despite partial devaluation tendencies, both studies revealed that participants adapted their beliefs in direction of the evidence presented. Our findings suggest that the (perceived) soundness of evidence may be a relevant factor for eliciting science devaluation.

Unpacking pre-service teachers' beliefs and reasoning: A scenario-based approach
Presenting Author: Leila Ferguson, Kristiania University College, Norway; **Co-Author:**Ivar Bråten, University of Oslo, Norway

The beliefs teachers hold may provide information about their more or less evidence-informed reasoning about educational issues. However, gaining a clear picture of teachers' beliefs has proven difficult. A promising line of inquiry uses scenario-based approaches to assess teachers' enacted beliefs. Accordingly, we assessed 75 Norwegian pre-service teachers' beliefs about student ability, sources of teaching knowledge, and teacher efficacy by analyzing their written responses to authentic classroom scenarios, with these responses also providing information about participants' reasoning about the scenarios. While participants' responses seemed to be evidence-informed in many ways, there were also indications of the opposite, such as limited consideration of educational research in pedagogical decision-making. For example, most participants opted to rely on informal knowledge sources such as experienced colleagues, and hardly referred to educational research at all, neither as sources of teaching knowledge nor when justifying their choice of sources. The results contribute uniquely to an understanding of pre-service teachers' beliefs and reasoning about educational issues by showing the nuances of teacher beliefs about student performance, sources of teaching knowledge, and teacher-efficacy, and they provide further insight into pre-service teachers' limited consideration of research as evidence in pedagogical decision-making. As such, they may help researchers and teacher educators to better understand the beliefs preservice teachers hold, as well as to facilitate further development of these beliefs. Implications for future research and teacher education are discussed, such as a need for more qualitative investigations and the role of teacher educators in addressing pre-service teachers' beliefs.

Evidence-based and -informed education: Objections and future directions
Presenting Author: Izaak Dekker, Amsterdam University of Applied Sciences (AUAS), Netherlands; **Co-Author:**Martijn Meeter, Vrije Universiteit Amsterdam, Netherlands

Over the past two decades, educational policymakers in many countries have favored evidence-based and -informed educational programs and interventions. However, Evidence-Based and -Informed Education (EBIE) have met with growing resistance from educational researchers. This essay reviews the objections against EBIE and its preference for randomized controlled trials (RCT). We conclude that the objections call for adjustments, but do not justify abandoning EBIE. Three future directions could make education more evidence-based whilst taking the objections against EBIE into account: 1) study local factors, mechanisms and implementation fidelity in RCTs, 2) utilize and improve the available longitudinal performance data and 3) use integrated interventions and outcome measures.

Session R 7

26 August 2023 09:45 - 11:15
AUTH_DC2
Symposium
Instructional Design

Problem-solving prior to instruction as an example of composite instructional designs

Keywords: Cognitive Skills and Processes, Example-based Learning, Feedback, Instructional Design, Learning Approaches, Problem Solving, Problem-based Learning, Quantitative Methods, Simulation-based Learning
Interest group: SIG 06 - Instructional Design
Chairperson: Katharina Loibl, University of Education Freiburg , Germany
Chairperson: Timo Leuders, University of Education Freiburg , Germany
Discussant: Ido Roll, Technion - Israel Institute of Technology, Israel

Instruction often includes multiple phases with different pedagogies and goals. Research on such composite instructional designs – e.g. problem-solving prior to instruction (PS-I) – often targets questions on the instruction level, such as: Which temporal order of the phases has the largest effect on learning outcomes? We argue that investigating composite instructional designs benefits from linking elements at all three levels and across all learning phases: knowledge structure, learning processes, and instructional design (Koedinger et al., 2012). More specifically, one should take into account the modification of the learning processes in the second phase due to the intermediate knowledge or the affective-motivational state resulting from the first phase (Fig. 1). Such work looks beyond main effects of "ideal" designs, and seeks to identify the role of cognition and context.
Four groups present their studies on PS-I and similar composite designs, focussing on the interaction of a problem-solving and an instruction-phase: Paper 1 compares the effect of different types of preparations in the first phase and their effects on learning in the second phase. Paper 2 investigates how the breadth of knowledge activation in the first phase prepares for learning in the second phase. Paper 3 investigates the influence of varied feedback timing during the problem-solving phase on learning mechanisms, and on the acquisition of medical knowledge and skills. Paper 4 investigates learning outcomes depending on the temporal order of problem solving and instruction for motor learning.
Koedinger, K., Corbett, A., & Perfetti, C. (2012). The Knowledge-Learning-Instruction framework. Cognitive science, 36(5), 757-798.

Open problem-solving, working on solved problems or fading to prepare for learning from instruction?
Presenting Author: Katharina Ockl, University of Erfurt, Germany; **Co-Author:**Christina Schulz, University of Freiburg, Institute of Psychology, Germany; **Co-Author:**Lennart Schalk, PH Schwyz, Switzerland; **Co-Author:**Inga Glogger-Frey, University of Erfurt, Germany

Open problem-solving (inventing) or working through a solved problem (worked example) can prepare students for learning from subsequent direct instruction. Both types of preparation could foster the acquisition of intermediate knowledge which, in turn, can facilitate learning from subsequent instruction. However, this effect may depend on the quality of the acquired intermediate knowledge which can be better controlled via worked examples. The present study aims at testing this assumption; that is, whether fading of support leads to better transfer than two phases of the same preparation activity. In an experiment, high-school graduates (N = 60) either invented twice (inventing condition), worked on a worked example twice (worked example condition), or worked first on a worked example followed by one inventing activity (fading condition). On a final transfer test, fading led to significantly better scores than inventing. The advantages of fading compared to worked examples failed to reach significance. Learners' need-for-cognition moderated the effect of experimental condition on transfer. Learners with high need-for-cognition showed better transfer performances if support during the preparation phase was faded. Therefore, especially learners with high need-for-cognition may benefit from faded support.

The role of students' breadth of prior knowledge activation in preparation for learning
Presenting Author: Charleen Brand, Ruhr University Bochum, Institute of Educational Research, Germany; **Co-Author:**Katharina Loibl, University of Education Freiburg, Germany; **Co-Author:**Nikol Rummel, Ruhr University Bochum, Germany

In problem solving prior to instruction, students' conceptual learning is afforded through an initial problem-solving phase, in which students deal with an unknown problem that prepares them for a following instruction. Activating prior knowledge during problem solving is assumed to be one learning mechanism that facilitates this preparation. Previous findings suggest that students' activated knowledge needs to be (1) conceptually broad and (2) relevant to the targeted principles. However, we lack systematic research on how and when knowledge activation in a problem solving phase affords learning during an instruction phase. Therefore, in the present study, we specifically prompted students' activation of knowledge by showing them erroneous solution attempts of other students. The solution attempts varied in the coverage of knowledge components of the targeted principles that were included. A high coverage of knowledge components aimed at a broad activation of prior knowledge and a low coverage at a more limited activation. An intermediate knowledge test after the problem-

solving phase served as a manipulation check for students' activation of knowledge during problem solving. To control for the testing effect, only half of the students answered this test. Thus, we implemented a 2x2-design with high versus low coverage solution attempts and present versus absence of the intermediate knowledge test. We did not find a significant difference in conceptual knowledge after instruction for high versus low coverage solution attempts, nor the intermediate knowledge test, or the interaction of both factors.

Formative feedback timing problem-solving in virtual environment simulations for medical education
Co-Author: Christian Fässler, Swiss Federal Institute of Technology ETH Zurich, Switzerland; **Co-Author:**Tanmay Sinha, Professorship for Learning Sciences and Higher Education, ETH Zurich, Switzerland; **Co-Author:**Christian Schmied, ETH Zurich, Switzerland; **Co-Author:**Jörg Goldhahn, ETH Zurich, Switzerland; **Co-Author:**Manu Kapur, ETH Zurich, Switzerland; **Co-Author:**Charlotte Müller, ETH Zurich, Switzerland

Despite acquiring vast content knowledge about the functioning of the human body through university teaching, medical students struggle to transfer that knowledge to one of the core disciplinary practices – differential diagnosis. The authors aimed to overcome this problem by implementing computer-based virtual environment (CVE) simulations in medical education courses. In our study, such simulations were implemented in the problem-solving phase of the problem-solving prior to instruction (PS-I) paradigm. The subsequent instruction phase was represented by a monologue video lecture. The major goals of the present study were to investigate how the timing of feedback in the computer-based virtual environment problem-solving phase (a) influence learning mechanisms of PS-I such as knowledge gap awareness and state curiosity and (b) learning outcomes after the instruction phase such as the acquisition and transfer of clinical knowledge and clinical reasoning skills. We found that no formative feedback provision resulted in significantly higher state curiosity after the problem-solving phase than delayed feedback provision. All other comparisons did not reveal significant differences in state curiosity and the remaining measurements of learning mechanisms. At what point of time – if at all – feedback should be provided during or after problem-solving in the computer-based virtual environment depends on the targeted learning outcome. Importantly, neither instant, delayed, or no feedback had detrimental effects on learning. However, the assessed learning mechanisms seem to play a minor role in learning outcome facilitation as they were triggered similarly among the various feedback timing in the problem-solving phase.

Problem-solving prior to instruction in motor learning – the case of javelin throwing
Presenting Author: Christian Leukel, University of Education Freiburg, Germany; **Co-Author:**Katharina Loibl, University of Education Freiburg, Germany

A question that many parents face when their child learns to ride the bicycle concerns the temporal order of instruction and self-determined practice. In physical education, where motor-learning plays an important role, a systematic evaluation of this temporal order on learning outcomes is so far missing. Therefore, in the present study, ninety 7th graders were tested on their ability to learn javelin throwing. They either received instruction on the technical movement features of javelin throwing before self-determined practice (I-PS), or they started with self-determined practice and received the instruction afterwards (PS-I). Learning-related changes in throwing distance were measured for javelin throwing. Javelin throwing distance increased and technical features of the throws improved in both PS-I groups, but not in I-PS groups. We discuss potential underlying mechanisms of this effect, in particular the role of awareness of knowledge gaps through initial practice that could be elaborated on during subsequent instruction, and the suppression of implicit learning processes with instruction.

Session R 8

26 August 2023 09:45 - 11:15
UOM_A03
Symposium
Teaching and Teacher Education

Teacher Professional Development: Digital simulation, Videos and Peer learning

Keywords: Communication Skills, Educational Technologies, Feedback, Higher Education, Peer Interaction, Simulation-based Learning, Teacher Efficacy, Teacher Professional Development, Video-based Learning
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Inga Staal Jenset, University of Oslo, Norway
Organiser: Katrine Nesje, University of Oslo, Norway
Organiser: Toril Aagaard, Norway
Discussant: Sigrun K. Ertesvag, University of Stavanger, Norway

This symposium investigates Scandinavian initiatives that aim to deal with the overall challenges of reducing the theory–practice gap in teacher education and preparing students better for their future careers as teachers. As discussed in the four presentations, all of the initiatives involve innovation and implementation of didactic designs in which students are assigned active roles and digital technologies are exploited. In the first presentation, virtual reality (VR) simulations are used for students' practice in leading developmental talks. In the second presentation, desktop simulations are used to train students in teaching math, specifically fractions, to a small group of virtual pupils. In the third and the fourth presentations, pre-service teachers' video-record their teaching and share a selected sequence in peer-mentoring conversations as the point of departure for further professional reflection. Across these qualitative studies, it is found that both digital simulations and the use of videos from students' teaching practices in schools can potentially tighten the links between theories and practices in teacher education if integrated in learning designs that are developed to promote coherence. Furthermore, all of the interventions show how digital technologies innovated for educational purposes, combined with didactic designs, can be used to expose students to authentic situations and tasks close to what they will face in schools. Hopefully, this knowledge will inspire other teacher educators to engage in preparing students better for the great societal responsibilities that lie ahead in schools and classrooms.

CANCELLED: Using immersive virtual reality simulation for and with students (...)
Presenting Author: Lynn Dittrich, University of South-Estern Norway, Norway

This presentation has been cancelled and will not be presented at EARLI 2023.There have been widespread calls for higher education programmes to offer more active, innovative approaches to learning, particularly in the teacher education field. One innovative approach is provided by using immersive technologies, such as virtual reality (VR) for students to develop work-relevant skills in collaboration with peers. However, little is known about the role of peer-facilitation in simulated learning environments since most simulation experiences are educator-led. This study addresses this gap by exploring how VR simulations might support pre-service teachers' professional development. In this study, pre-service teachers engaged in parent-teacher meetings by means of a scenario-based VR simulation. This task was led by student facilitators who had previously undergone the same simulation experience themselves. In the context of peer-facilitated learning, this study focuses on the student facilitators' experiences. Thus, this study aims to explore both how these students' parent-teacher communication competence is supported by the VR simulation, and how the facilitator role enhances their professional development. The data include individual qualitative surveys (n=11) and focus group interviews (n=3) with student facilitators. The data will be analysed using thematic analysis. Preliminary findings indicate that the facilitators valued experiencing the varied ways different students enact and reflect upon parent-teacher conversations. Further, they report that VR simulations are beneficial for training on scenarios that are difficult to emulate in real-school settings that they suggest more content should be developed to better prepare student teachers for facing challenging situations.

Improving teaching skills with simulation training: Pre-service teachers' retrospect
Presenting Author: Marcus Samuelsson, Department of Behavioural science and learning, Sweden; **Co-Author:**Anja Thorsten, Department of Behavioural Sciences and Learning, Sweden; **Co-Author:**Cecilia Sveider, Department of Behavioural Sciences and Learning (IBL), Sweden; **Co-Author:**Joakim Samuelsson, IBL, Sweden

One possible way to challenge the well-known fact that pre-service teachers have limited opportunities to realistically practice teaching and develop skills and strategies was handled with the help of simulation- training. Two cohorts of pre-service teachers, in total 104, were given the opportunity to teach mathematics, specifically fractions, to a small group of virtual pupils. Within the framework of a course in mathematics didactics, the students in groups of three planned and

conducted lessons, where they alternated between acting and observing each other under the supervision of two instructors, with expertise in mathematic didactics and classroom management, respectively. After each lesson, the instructors gave feedback and feedforward concerning aspects that were good and aspects to consider and modify in the future. To find out what the pre-service teachers remembered from the simulation training, group interviews were conducted 6 months and 18 months, respectively, after the simulation -training. The analyses of the interviews revealed that the pre-service teachers found the training realistic and useful, as well as gave them thechance to practise teaching in a '"safe"' setting. They also learned a lot from watching peer students teach the virtual pupils and being able to '"pause"' the lesson and reason with their peers. They also mentioned the instructors' feedback that they received, directly connected to their lesson. The simulation-training emotionally affected the students as no other form of teacher training had done so far. Simulation-training seems to be a productive complement to traditional forms of teacher education.

The use of authentic practice videos in peer-mentoring of preservice teachers
Presenting Author: Katrine Nesje, University of Oslo, Norway; **Co-Author:**Torunn Strømme, University of Oslo, Norway

This study investigates the use of authentic practice videos (APVs) in peer-mentoring conversations with pre-service teachers (PTs) in university-based teacher education. PTs' use of APVs can contribute to professional development through reflection, providing a connection between canonical knowledge of teaching and learning presented in course work, as well as experience in fieldwork when practising teaching. However, video-based reflection will benefit from a guide in order to facilitate deeper reflection. We developed a guide for peer-mentoring, containing a set of exploratory questions and introducing theoretical concepts of teaching and learning. This study's particular interest lies in *how* PTs used the guide in structuring and supporting peer-mentoring conversations, as well as in their positioning in the conversations. The sample consists of 16 PTs discussing their APVs in small peer-mentoring groups and using the guide as a common starting point. In the analysis, 'conceptual framing' and 'positional framing' are taken as points of departure. The findings show that theoretical concepts introduced in the guide (related to classroom conversations) helped PTs connect theory to the practice unfolding in the APVs. The guide was also used actively and contributed to the structure of the peer-mentoring conversations. The PTs took different positions in the conversations related to how they used the guide. They used the word 'reflection' when describing their experiences with using APVs in peer-mentoring conversations. The findings indicate that the link to theory and the discussion with peers drive the reflection process.

Peer-feedback on classroom-videos: A hope for coherence in teacher education?
Presenting Author: Toril Aagaard, University of Southeast Norway, Norway; **Co-Author:**Lene Joensen Kjær, University of South-eastern Norway, Norway

Two challenges are approached in the didactic design discussed in this session. The first aims to reduce the theory–practice gap in teacher education (TE), and the second to provide better support for professional development of pre-service teachers enrolled in an online TE programme. The design includes using video recordings from students' school practice to professionalize in peer groups. The video-app and didactical design was first innovated by the University of Oslo (UiO), before University of South-Eastern Norway (USN) joined to investigate how the app and the didactic design could be integrated across institutions. This presentation focuses on lessons learned from this. To prepare this intervention, we first analysed video data from UiO to find that these indicate the design's great potential to link theories and practices. However, the shared video sequences came across as efforts to enact theories in practice. As we at USN wanted the students to discuss challenges with peers, we explicitly asked them to do so and highlighted that the intention with design was professional development, not evaluating skills. In the presentation, the following questions are answered: What are the USN students' perspectives on the learning design introduced to promote coherence and professional development in their online TE programme? What characterises their efforts to engage in joint knowledge creation in peer groups? 'Coherence' and 'trialogues' are applied as analytical concepts, and the study is significant as it reveals the potentials of peer-feedback of classroom-videos as means for coherence and professional development in TE.

Session R 9

26 August 2023 09:45 - 11:15
AUTH_T102
Single Paper
Learning and Special Education

Reading and Writing Difficulties

Keywords: Assessment Methods, Cognitive Development, Inclusive Education, Learning and Developmental Difficulties, Learning and Developmental Disabilities, Primary Education, Reading, Writing/Literacy
Interest group: SIG 15 - Special Educational Needs
Chairperson: Freya Winterle, University of Vienna, Austria

Identification of parental dyslexia and its influence on how children's dyslexia is predicted
Keywords: Assessment Methods, Learning and Developmental Difficulties, Learning and Developmental Disabilities, Reading
Presenting Author: Daria Khanolainen, University of Jyväskylä, Finland; **Co-Author:**Jenni Salminen, University of Jyväskylä, Finland; **Co-Author:**Kenneth Eklund, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland; **Co-Author:**Minna Torppa, University of Jyväskylä, Finland

By investigating children whose parents have dyslexia, family risk (FR) studies are expanding our understanding of the intergenerational transmission of dyslexia. These studies, however, vary in their identification of FR, and how the use of different identification methods influences research findings and conclusions is yet to be systematically investigated. This study aims to evaluate the association between two FR identification methods—parental self-reports and direct skill assessments—and their unique contributions in the prediction of children's reading.The study draws on two longitudinal data sets that include parental questionnaires, parental tests, and child assessments. The first data set had a prospective FR sample (half of the parents in the sample had dyslexia and the remaining half did not). The second data set had an unselected sample. Both samples include approximately 200 families. To analyse data, we constructed hierarchical regressions and longitudinal path models.Parental self-reports and direct skill assessments correlated strongly (.60) in the prospective FR sample and moderately (.42) in the unselected sample. Both identification methods were almost equally predictive of children's reading fluency in the prospective FR sample. At the same time, in the unselected sample, parental skills were not predictive of children's reading, whereas self-reports were. The two FR identification methods seem to have equally high predictive power when the variability in parental data is high. Parental self-reports demonstrated higher predictive power than we expected. They can be effectively used to screen parents ensuring early identifications of children at risk for dyslexia and facilitating early targeted interventions.

The Relation between Spelling and IQ: A meta-analytic review
Keywords: Cognitive Development, Learning and Developmental Difficulties, Learning and Developmental Disabilities, Writing/Literacy
Presenting Author: Sietske van Viersen, Utrecht University, Netherlands; **Co-Author:**Elise de Bree, Utrecht University, Netherlands; **Co-Author:**Jolijn Vanderauwera, UC Louvain, Belgium

The role of IQ in diagnosing a spelling deficit is nowadays limited to IQ >70, but implicit assumptions about the relation between spelling and intelligence continue to influence both research and clinical practice. This study addresses existing issues by determining the relations between spelling ability and intelligence and potential moderators. Two separate meta-analyses were conducted, one on 59 correlational studies involving 63 independent typically developing (TD) samples and one on 62 subgroup studies involving 78 independent samples of children with a spelling deficit (e.g., dyslexia or dys[ortho]graphia). The results showed that spelling is moderately related to verbal IQ (r = .35, 95% CI [.29, .41]), weakly to nonverbal IQ (r = .26, 95% CI [.22, .31]), and moderately to total IQ (r = .48, 95% CI [.39, .57]). Group differences between children with a spelling deficit and TD control groups are medium for verbal IQ (d = .52, 95% CI [.41, .64]), small for nonverbal IQ (d = .24, 95% CI [.16, .31]), and medium for total IQ (d = .50, 95% CI [.39, .62]). Moderators include those related to the measurement of spelling (task format/complexity/length, stimulus type/length) and intelligence, as well as sample characteristics and general covariates. These moderator analyses are currently conducted. The findings of both meta-analyses are discussed in light of current practices surrounding

research into and clinical diagnosis of children with a spelling deficit.

Comparison of different settings in the support of graphomotor skills in first graders
Keywords: Inclusive Education, Learning and Developmental Difficulties, Primary Education, Writing/Literacy
Presenting Author: Judith Sägesser, University of Teacher Education Bern, Switzerland; **Co-Author:**Michelle Maurer, University for Teacher Education Berne, Switzerland; **Co-Author:**Lidia Jana Truxius, PHBern, University of Teacher Education, Switzerland; **Co-Author:**Joséphine Schwery, University for Teacher Education Berne, Switzerland; **Co-Author:**Michael Eckhart, University of Teacher Education Bern, Switzerland

Graphomotor and visuomotor skills, as well as fine motor skills, play a key role in children's transition to school. In this project, which is funded by the Swiss National Science Foundation, three different settings of support and multiprofessional collaboration between teacher and psychomotor therapist were compared. The graphomotor skills of first grade children (N=1334) were measured with a paper and pencil test and with digital measures. We will analyze the impact of the different settings on fine- and graphomotor performance progress across 1.5 years. First longitudinal results are expected by the end of the year and will be available for the conference.

Session R 10

26 August 2023 09:45 - 11:15
UOM_A13
Single Paper
Higher Education, Motivational, Social and Affective Processes

Well-being in University Students

Keywords: Anxiety and Stress, Assessment Methods, Burnout, Engagement, Feedback, Higher Education, Learning Approaches, Metacognition, Motivation, Quantitative Methods, Self-regulated Learning and Behaviour, Tool Development, Well-being
Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion
Chairperson: Hinke Endedijk, Leiden University, Netherlands

Being well in academia: A systematic literature review on operationalizing wellbeing.
Keywords: Anxiety and Stress, Engagement, Higher Education, Well-being
Presenting Author: Aisha Miren Iqbal Ruiz, Maastricht University, Netherlands; **Co-Author:**Wim Gijselaers, Maastricht University, Netherlands; **Co-Author:**Simon Beausaert, Maastricht University, Netherlands; **Co-Author:**Inken Gast, Maastricht University, Netherlands

Higher education institutions (HEI) are workplaces with high occupational health risks. Academics face high rates of burnout, stress, and mental illness, making monitoring faculty wellbeing imperative. Wellbeing at work is a complex construct with many different conceptualizations and measures. The lack of consensus on operationalizing wellbeing creates difficulties in interpreting research findings, with consequences for practice.
This systematic review provides an overview of how wellbeing is defined and measured in the academic setting. Current research shows that definitions for wellbeing are frequently implied rather than stated and sometimes omitted altogether. This lack of clarity in definitions can create misalignments with measures and the conceptualizations implied in the definitions used. In studies with explicit definitions, wellbeing operationalizations ranged from affect and positive emotion-based ones to more holistic ones with multiple conceptualizations and measures.

Motivational orientation profiles and study well-being among higher education students
Keywords: Higher Education, Motivation, Quantitative Methods, Well-being
Presenting Author: Satu Laitinen, University of Turku: Department of Teacher Education, Finland; **Co-Author:**Ari Kaukiainen, University of Turku, Department of Psychology and Speech-Language Pathology, Finland; **Co-Author:**Tiina Tuominen, University of Turku, Study and Work Well-being Services, Finland

A person-centered approach was applied to identify the motivational orientation profiles in a representative sample of 1,533 higher education students in Finland at different stages of their studies. We also explored the extent to which study engagement, burnout, and academic achievement served as indicators of a student's identification with a particular motivational orientation profile at the individual level. Three groups of students with distinctive motivational orientation profiles—s*tudy-oriented*, *moderately-oriented*, and *avoidance-oriented*—were identified using latent profile analysis. The results showed that increased study engagement and academic achievement, in terms of study credits, were associated with belonging to the *study-oriented* group. Students showing increased study burnout were associated with the *avoidance-oriented* group. The *moderately-oriented* students reported average levels of motivation relative to the two other groups. The study also considered the importance of assessing motivational orientation, study well-being, and academic achievement across different stages of study, seeing this as potentially beneficial to academic careers.

Supporting student reflection by using a survey on learning processes and wellbeing
Keywords: Feedback, Learning Approaches, Metacognition, Well-being
Presenting Author: Anne Haarala-Muhonen, University of Helsinki, Finland; **Co-Author:**Mirja Ruohoniemi, University of Helsinki, Finland; **Co-Author:**Anna Parpala, University of Helsinki, Finland

The present study examines the variance in the first-year law students' experiences and reflection of the counter feedback they have gained from filling in a survey focusing on their learning processes and risk of study-related burnout. Altogether 101 students provided open-ended answers. The data were analysed by using a qualitative content analysis. The results showed that the counter feedback offered students an organised and guided opportunity for reflection, and students' responses indicated that this increased their awareness of their learning processes and wellbeing. The students paid particular attention to the organising and time management skills, as well as the impact on their wellbeing. The majority of students found the counter feedback useful, and with the use of concrete examples, they expressed how they will develop their learning processes and what concrete actions they would take to improve their wellbeing. The results imply that counter feedback on students' learning processes and wellbeing is an effective way of supporting students' metacognitive awareness and further, guidance for reflection is needed to help them to get full benefit of their personal feedback to improve studying, learning and well-being.

University students' study progress and study success related to their well-being profiles
Keywords: Burnout, Engagement, Higher Education, Quantitative Methods
Presenting Author: Elisa Vilhunen, University of Helsinki, Finland; **Co-Author:**Noona Kiuru, University of Jyväskylä, Finland; **Co-Author:**Anne Mäkikangas, Tampere University, Finland; **Co-Author:**Kati Vasalampi, University of Jyväskylä, Finland; **Co-Author:**Johanna Rantanen, University of Jyväskylä, Finland

This study examines, first, university students' well-being profiles utilizing the circumplex model of occupational well-being, and second, how students' well-being profiles are related to their self-reported study success and study progress. A total of 316 Finnish university students participated in a two-wave longitudinal study, in which they filled in an e-survey containing a set of study-related well-being measures. Student well-being profiles and transitions between the profiles were analysed with latent profile analysis and latent transition analysis. Four latent classes were identified: "Ordinary", characterized by close to average values in all well-being measures; "Engaged and satisfied", characterized by high values of engagement and satisfaction; "Engaged holists", characterized by relatively high levels of engagement, studyholism and burnout; and "Bored and burned out", characterized by high levels of boredom and burnout. Transitions were mainly from better well-being to worse. Further, the relations between the profiles and study success and progress were analysed using a Kruskall-Wallis test. Both "Engaged and satisfied" and "Ordinary" were found to experience better study success than "Engaged holists" and "Bored and burned out". Similarly, both "Engaged and satisfied" and "Ordinary" experienced better study progress than "Engaged holists" and "Bored and burned out". Thus, similarly as workholism also studyholism should be avoided even though it might seem as something to be pursued. Overall, the findings of this study widen the understanding about study well-being not only as a one-dimensional but multidimensional phenomenon which has its equivalence in occupational well-being.

Construct Validation of an Instrument to Measure Student Well-Being in Academic Settings

Keywords: Assessment Methods, Self-regulated Learning and Behaviour, Tool Development, Well-being
Presenting Author: Ramin Rostampour, University of Victoria, Canada; **Co-Author:**Meg Kapil, University of Victoria, Canada; **Co-Author:**Allyson Hadwin, University of Victoria, Canada

Academic Wellbeing, the subjective sense of how well students feel about and perform in their academic contexts, has gained attention as an important student success factor. This study introduces a scale for assessing well-being in academic settings, the Academic Well-Being Scale (AWBS). The AWBS provides a measurement solution to the shift in conceptualizations of student success towards flourishing and thriving and away from outcome markers alone. The AWBS is informed by extant research on mental health and well-being and current approaches to student success that include both psychosocial and academic elements. This scale is an adaptation of the Mental Health Continuum Short Form (MHC-SF; Keyes, 2009), tailored for the academic context. Findings support validity, reliability, and improved predictive capacity of the AWBS over the MHC-SF for a sample of university students (N=221). Analysis for concurrent validity shows strong positive associations with (a) MHC-SF, (b) self-regulated learning (SRL) practices, (c) foundational academic behaviours, and (d) students' expected GPA. Comparing the predictive power of the AWBS to the original MHC-SF shows the AWBS predicts a wider range of academic challenges compared to MHC-SF and is associated with students' expected GPA while the MHC-SF is not. Findings highlight the potential application of this measure in research regarding adaptive student learning and student success outcomes. Further, in the current context of global change and uncertainty, the AWBS is consistent with student success trends that integrate psychological processes alongside academic processes in the study of learning, supporting students to not merely survive but thrive.

Session R 11

26 August 2023 09:45 - 11:15
AUTH_T202
Single Paper
Learning and Instructional Technology, Learning and Social Interaction, Teaching and Teacher Education

Beliefs of Early Childhood Educators and Primary School Teachers

Keywords: Attitudes and Beliefs, Competencies, Computer-assisted Learning, Early Childhood Education, Foreign and Second Language Acquisition, Higher Education, Migrant / Refugee and Minority students, Mixed-method Research, Pre-service Teachers, Primary Education, Quantitative Methods, Science Education
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education
Chairperson: Ma. Jenina N. Nalipay, The Chinese University of Hong Kong, Hong Kong

Profiling Pre-service Early Childhood Teachers' Perceptions of Learning Management Systems
Keywords: Computer-assisted Learning, Early Childhood Education, Higher Education, Pre-service Teachers
Presenting Author: Rohnii Tse, Yew Chung College of Early Childhood Education, Hong Kong; **Presenting Author:**Elaine Lau, Yew Chung College of Early Childhood Education, Hong Kong; **Co-Author:**Fred Chan, Yew Chung College of Early Childhood Education, Hong Kong

Despite the vast availability of studies on teachers' technology adoption using variable-centered approaches, research that focuses on pre-service early childhood education (ECE) teachers' technology adoption from a person-centered perspective is scarce. Drawing on a sample of 220 pre-service ECE teachers in Hong Kong, this study employed latent profile analysis to identify three distinct profiles of students' endorsement of LMS features/interfaces: skeptics, moderate users, and enthusiasts. Skeptics displayed the lowest perceived LMS learning benefits, followed by moderate users, and LMS enthusiasts were associated with the strongest perceived benefits. Gender, immigrant status, and LMS usage frequency were all significant predictors of students' LMS endorsement profile membership. Implications of findings are discussed.

Pre-service primary school teachers' beliefs on interactive book reading in multilingual contexts
Keywords: Attitudes and Beliefs, Foreign and Second Language Acquisition, Pre-service Teachers, Primary Education
Presenting Author: Eline Decraene, Ghent University, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium

Increasingly more children grow up in a region where the dominant language does not correspond to their home language. Despite the highlighted importance to create rich language learning environments in schools, second language learners still experience major difficulties in acquiring the language of instruction. In this regard, interactive book reading (IBR) has been put forward as a promising approach in view of language development. Despite the advantages of IBR for (multilingual) children in both pre- and primary school, only a limited number of studies focuses on IBR in the primary grades. To get insights in potential underlying barriers that teachers experience with implementing IBR in their practice, the present study focuses on pre-service primary school teachers' beliefs on implementing IBR in multilingual contexts. Semi-structured interviews were conducted with 36 pre-service primary school teachers. Preliminary results of the thematic analysis reveal that behavioral, normative, and self-efficacy beliefs, as distinguished by Ajzen (1991), were found in teachers' responses. Moreover, the answers show superficial pedagogical content knowledge on IBR in multilingual contexts since various IBR characteristics, which are found in the research literature as effective elements responsible for the added value of IBR for students' language development, are not (in depth) referred to by the participants. The findings highlight important themes to consider and revisit in view of optimizing pre-service teacher education and in-service teacher professionalization.

Preschool Teachers' Beliefs Towards the Importance of Diagnostics in Early Science Learning
Keywords: Attitudes and Beliefs, Early Childhood Education, Mixed-method Research, Science Education
Presenting Author: Mirjam Steffensky, University of Hamburg, Germany; **Co-Author:**Laura Venitz, University of Koblenz-Landau, Germany; **Co-Author:**Miriam Leuchter, RPTU Landau, Germany; **Co-Author:**Ilonca Hardy, Goethe-Universität Frankfurt, Germany; **Co-Author:**Anika Bürgermeister, University of Leipzig, Germany; **Co-Author:**Katharina Junge, University of Hamburg, Germany; **Co-Author:**Henrik Saalbach, University of Leipzig, Germany

Diagnosing children's prior knowledge, developmental affordances, and learning processes is a highly demanding task for preschool teachers. Professional competencies, in particular knowledge and beliefs, are an important prerequisite for a productive implementation of diagnostic measures. However, studies have shown that preschool teachers are not sufficiently trained in science teaching and have limited knowledge or inadequate beliefs regarding children's science learning. Thus, they lack important prerequisites for the diagnosis of key competencies that are important for children's learning in the context of science. Beliefs, as a central facet of professional competence, act as a filter for interpreting classroom situations. On this basis, they might be understood as a precursor of teacher's behavior. In this framework, we conducted a study examining preschool teachers' beliefs about effective science education, the importance of diagnostics, their use of diagnostic measures and their interrelationship. Our data consisted of $N = 20$ preschool teachers. Their self-efficacy beliefs about diagnosing and promoting children's science learning as well as learning beliefs were assessed using a questionnaire. Guided interviews were conducted to measure beliefs about effective early science learning and towards the importance of diagnostics in preschool. The results of the questionnaire indicate, that they have high self-efficacy beliefs with regard to diagnosing and fostering children's science learning and that they mainly agree with the co-constructive and self-directed learning beliefs. However, the interview results show that they do not value the use of diagnostic measures for fostering children's science learning and that early science education is primarily seen as self-education.

When judgements are biased by students' immigrant background, intervention can counteract
Keywords: Competencies, Migrant / Refugee and Minority students, Pre-service Teachers, Quantitative Methods
Presenting Author: Christin Laschke, Leibniz-Institute for Science Education (IPN), Germany; **Co-Author:**Bettina Roesken-Winter, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Lars Jenßen, Humboldt-Universität zu Berlin, Germany

Teachers' judgements bear the risk being biased by implicit stereotypes. A few evidence on how judgement biases can be reduced point to the relevance of immersing (pre-service) teachers in an intensive examination of both the relevance of stereotypes and consequences for students. Further evidence by

mathematics education research studies revealed different judgement profiles, ranging from focusing on subject-specific aspects such as understanding and procedural aspects or non-subject specific such as motivation. Moreover, it could be shown, that engaging with students' products led teachers to focus less on subject-independent aspects and more on students' understanding. Our study examines whether different profiles of pre-service teachers' diagnostic judgements can be identified and if the immigrant background of the students whose products are assessed determines whether pre-service teachers belong to a certain profile before and after an intervention on subject-related assessments as well as stereotypes and their consequences for students. The study was conducted as a randomized controlled trail (n = 209). The experimental group received a six hours intervention on subject-related assessments based on student products as well as on stereotypes and their consequences for learners. According to the results of *Latent Transition Analyses* the immigrant background of the students predicted the belonging to the group that judged below average before the intervention in both groups, after the intervention only the control group. The results suggest that the intervention helped to minimize the judgement biases caused by students' immigrant background. Further analyzes regarding additional student characteristics are needed.

Session R 12

26 August 2023 09:45 - 11:15
AUTH_TE2
Single Paper
Educational Policy and Systems, Learning and Special Education

Inclusive Education

Keywords: Early Childhood Education, Educational Policy, Inclusive Education, Learning and Developmental Disabilities, Motivation, Pre-service Teachers, Primary Education, School Leadership, Science Education, Special Education, Teaching/Instructional Strategies
Interest group: SIG 08 - Motivation and Emotion, SIG 15 - Special Educational Needs
Chairperson: Angela Stewart, University of Pittsburgh, United States

Leadership in inclusive ECEC cultures
Keywords: Early Childhood Education, Educational Policy, Inclusive Education, School Leadership
Presenting Author: Kati Sormunen, University of Helsinki, Finland; **Co-Author:**Raisa Ahtiainen, University of Helsinki, Finland; **Co-Author:**Arto Kallioniemi, University of Helsinki, Finland; **Co-Author:**Tapio Lahtero, University of Helsinki, Finland; **Co-Author:**Anni Loukomies, University of Helsinki, Finland

The recent reforms regarding the legislation and curriculum in the Finnish early childhood education and care (ECEC) have been aimed at ensuring the realisation of inclusion from the early years. Previous studies indicate that leaders play a significant role in creating and fostering a culture of inclusiveness and developing and implementing practices based on the principle of inclusion. This research examines how the ECEC centre leaders see inclusion and leadership in an inclusive educational context. We aim to clarify how inclusive education is constructed in ECEC leaders' discourses and examine what actions and procedures promote effective implementation of inclusion. The data were collected from thirteen ECEC leaders. We employed a focus group method to stir the participants to look at the phenomenon from different perspectives and reflect on barriers to change and opportunities for novel solutions. The interviews were studied by applying conventional content analysis. The results indicate that ECEC leaders perceive the legislation and ECEC curriculum as a tool to ensure child and human rights. However, there are differences in the quality of ECEC settings within the same municipality; not all centres have qualified staff, and there is a variation between different regions. In our presentation, we will elaborate and discuss our results in more depth.

The composition of pre-service teacher teams and children's competencies in inclusive education
Keywords: Inclusive Education, Pre-service Teachers, Primary Education, Science Education
Presenting Author: Frank Hellmich, Paderborn University, Germany; **Co-Author:**Fabian Hoya, Paderborn University, Germany; **Co-Author:**Jan R. Schulze, Paderborn University, Germany; **Co-Author:**Eva Blumberg, University of Paderborn, Germany

Team-teaching is regarded as an important prerequisite for children's successful learning processes in inclusive schools. Inclusive learning processes mastered by teachers cooperatively in teams are correlated to the best possible support of all learners in the classroom. However, studies give evidence that there are various challenges if teachers cooperate in inclusive classrooms. For instance, teachers evaluate team-teaching as not successful, if personal relationships are difficult. Currently, there are hardly any studies concerning the role of the composition of teams for students' competence development. Thus, we investigated children's competence development depending on a variation of the team composition.In our study, N = 142 pre-service primary school teachers and pre-service special needs teachers participated in a training to acquire competencies concerning their cooperation in inclusive education. Afterwards, they were assigned to one of our study groups. While half of the pre-service teachers could choose their tandem partners, the other half was arranged in pairs randomly. The pre-service teachers planned in tandems science lessons on the subject of renewable energies and taught groups of children over a period of three lessons. On the basis of pre- and post-tests, we investigated N = 804 children's development. Children who were taught by pre-service teachers in freely selected teams showed significant knowledge growth in a test on the subject of renewable energies compared to children who were taught by pre-service teachers in not freely selected teams.

Do we preach what we are? Studies on the antecedents of teachers' instructional goals
Keywords: Learning and Developmental Disabilities, Motivation, Special Education, Teaching/Instructional Strategies
Presenting Author: Panagiotis Varsamis, University of Macedonia, Greece; **Co-Author:**MELPOMENI TALLIDOU, University of Macedonia, Greece; **Co-Author:**Georgios Katsanis, Experimental Senior High School of University of Macedonia, Thessaloniki, Greece, Greece

Within the framework of Self-Determination Theory (SDT), educators' instructional goals refer to intrinsic vs extrinsic representations for preferred outcomes concerning their students' psychological development. Research on the antecedents of instructional goals remains scarce, especially in the realm of special needs and/or disability. In order to explore this issue, two cross-sectional studies were conducted. Participants responded to a video vignette, which presented a young boy with physical disability. In the first study, 475 in-service teachers, school-based care practitioners and undergraduate senior university students stemming from pedagogical departments participated. According to the results, state empathy and state recognition of the boy's basic psychological needs, as well as their combination, significantly mediated the path between participants' intrinsic life goals and intrinsic instructional goals, namely goals for personal growth and relationship growth. However, empathy and needs recognition did not statistically differ between each other regarding the strength of their mediating effects on instructional goals. In the second study, 321 elementary and secondary in-service teachers took part, from both general and special education schools. The results of the second study were similar to those of the first one. Additionally, state mindfulness significantly moderated the link between intrinsic life goals and needs recognition, particularly in participants presenting high mindfulness. The results shed light on the association between participants' life goals and instructional goals. Clarity about this structural entity may provide valuable information for disability studies and teacher training.

Session R 13

26 August 2023 09:45 - 11:15
UOM_A08
Single Paper
Assessment and Evaluation, Educational Policy and Systems

Large-scale Assessments of School and Teacher Effectiveness

Keywords: Achievement, At-risk Students, Educational Policy, Large-scale Assessment, Lifelong Learning, Pandemic, Quantitative Methods, School Effectiveness
Interest group: SIG 01 - Assessment and Evaluation, SIG 18 - Educational Effectiveness and Improvement

Chairperson: Benjamin Heinitz, Leibniz University Hannover, Germany

The relationship between quality and equity in education at system level: Secondary analyses of PISA
Keywords: Educational Policy, Large-scale Assessment, Quantitative Methods, School Effectiveness
Presenting Author: Leonidas Kyriakides, University of Cyprus, Cyprus; **Co-Author:**Maria Eliophotou, University of Cyprus, Cyprus; **Co-Author:**Evi Charalambous, University of Cyprus, Cyprus

Socioeconomic inequalities in education are an important issue for researchers and policymakers, since student achievement was found to be associated with students' socioeconomic status (SES). Educational effectiveness research investigates not only factors associated with student achievement (quality dimension of effectiveness), but also whether effective teachers/schools/systems can reduce the initial differences observed in student achievement which can be attributed to student background characteristics that are unlikely to change (equity dimension of effectiveness). This paper aims to explore the relationship between these two dimensions at the country level. To achieve this, secondary analyses of data from PISA 2015 and 2018 are conducted. Specifically, it is first explored whether educational systems which appear to be effective in relation to promoting student learning outcomes (quality) are also effective in relation to the equity dimension of effectiveness. Subsequently, it is examined whether improvement in the effectiveness status of countries in relation to one dimension of effectiveness can lead to the improvement of the other dimension. The results reveal a strong relationship between quality and equity at the country level since the achievement gap (in Mathematics, Science, and Reading) based on SES tends to be smaller in countries which achieve better results. It is also shown that the great majority of countries that can be considered as among the most effective in terms of the quality dimension are also among the most effective in terms of the equity dimension. Implications of the findings for promoting quality and equity are drawn.

Differences between countries in guessing behavior in international large-scale assessments
Keywords: Achievement, Large-scale Assessment, Quantitative Methods, School Effectiveness
Presenting Author: Jonas Dockx, KU LEUVEN, Belgium; **Co-Author:**Rianne Janssen, KU LEUVEN, Belgium

This study's aim was to assess whether differences between countries' average achievement in international large-scale assessments (ILSAs) are affected by differences in guessing behaviour on multiple-choice items. This research goal was prompted by the concern that ILSAs do not investigate differences in guessing behaviour between countries, while such differences could introduce construct-irrelevant variance in the achievement estimates. Accordingly, we used the data of the last two cycles of PIRLS, TIMSS and PISA to describe differences between countries in guessing behaviour. We used three types of IRT-models to assess these differences: a multiple-group 3PL-model with a unique guessing parameter per country, a multilevel 3PL-model where the guessing parameter was specified as a random country-level parameter, and a multiple-group 1PL-AG model with a different relationship between ability and guessing probability per country. Our interest was not in finding the best-fitting model, but whether differences between countries in the average disposition to guess correctly was stable across the models. The results showed that countries differ in their average disposition to guess correctly, with the different models showing similar results. We also found that countries' average disposition to guess correctly was positively related across ILSAs. However, the effect on countries' average achievement was limited.

ICT-skills of Flemish young adults according to PIAAC: the role of formal and non-formal education
Keywords: At-risk Students, Large-scale Assessment, Lifelong Learning, Pandemic
Presenting Author: Lisa Dewulf, Ghent University, Belgium; **Co-Author:**Lisse Van Nieuwenhove, Ghent University, Belgium; **Co-Author:**Fien De Smedt, Ghent University, Belgium; **Co-Author:**Bram De Wever, Ghent University, Belgium

Unqualified school leavers - the group of young adults who exit without a secondary education diploma - are more vulnerable in society. Frequent and productive use of ICT-skills at home is a prerequisite for efficient and effective problem-solving in today's society. The aim of this study is researching to what extent young school-leavers are mastering ICT-skills at home and to what the role formal and non-formal education is in relation to these ICT-skills. Based on the results of the linear regression analysis, using the PIAAC CY1 data of Flanders (Belgium, $n = 4340$), young school leavers were found to perform weaker for ICT-skills at home. Moreover, when they do not pursue formal or non-formal learning for job-related reasons, these performances are even weaker. We discuss that the impact of the COVID-19 pandemic threatens to widen the gap between highly skilled workers and low skilled workers & young school leavers for ICT-skills at home.

Session R 14

26 August 2023 09:45 - 11:15
UOM_R09
Single Paper
Higher Education, Learning and Instructional Technology, Motivational, Social and Affective Processes

Learning Analytics and Feedback

Keywords: Attitudes and Beliefs, Computer-assisted Learning, Conceptual Change, E-learning/ Online Learning, Engagement, Feedback, Higher Education, Learning Analytics
Interest group: SIG 03 - Conceptual Change, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 27 - Online Measures of Learning Processes
Chairperson: Lynn McAlpine, Canada

The Impact of Cognitive and Motivational Resources on Engagement with Automated Formative Feedback
Keywords: Attitudes and Beliefs, E-learning/ Online Learning, Engagement, Feedback
Presenting Author: Veronika Barkela, RPTU Kaiserslautern-Landau, Germany; **Co-Author:**Miriam Leuchter, RPTU Landau, Germany

Formative automated feedback has proven to be a supportive tool in online-learning-environments. However, the effectiveness of such feedback highly depends on cognitive, affective, and behavioral engagement. Research has shown that engagement is largely determined by learners' cognitive and motivational resources. Yet, most studies have only investigated either cognitive resources, such as mental effort, or motivational resources, such as expectancy-value-cost variables. When jointly modeled, the relationship between motivational beliefs and invested effort is ambiguous: (1) Motivational resources can influence cognitive, affective, and behavioral feedback engagement both directly and moderated by invested effort. (2) Previously invested mental effort can affect situational motivational resources which in turn affect feedback engagement. Therefore, the purpose of this study is to clarify the role of invested mental effort by identifying the model which best explains our empirical data.Data consists of 330 participants who worked in an online-learning-environment with automated formative feedback. Cognitive feedback engagement was indicated by the change in text quality in one session, affective feedback engagement by feedback acceptance, and behavioral feedback engagement by the number of feedback iterations. With SEM, we compared two models to clarify the role of invested mental effort. Results showed, that students who invested lower mental effort in the previous session have higher expectancy for success in the current session. Higher expectancy for success translates into lower feedback acceptance and more feedback iterations which in turn lead to higher achievement. This matches theoretical considerations that students' behavioral engagement is higher with higher expectancies for success.

Using Automated Individualized Feedback to Alter Learner Behavior in an Online Learning Environment
Keywords: Computer-assisted Learning, E-learning/ Online Learning, Feedback, Learning Analytics
Presenting Author: Carolin Hahnel, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Beate Eichmann, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Daniel Bengs, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Hendrik Drachsler, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Frank Goldhammer, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany

We investigated the effect of prompts from an automated individualized feedback on learner behavior in a digital learning environment. For this purpose, we

used trace data from an online course for pre-service teachers and examined whether the presentation of a specific feedback prompt leads to a change in the learning behavior addressed by the prompt. The online course consisted of five consecutive learning units. Process indicators related to multiple document processing were derived from trace data for each participant in each learning unit. Based on the process indicators, an automated individualized feedback dashboard was presented to the participants at the end of a learning unit. The feedback dashboard contained prompts on how to improve the individual learning behavior with regard to students' multiple document processing. Linear mixed models were estimated to investigate the relationship between the occurrence of specific feedback prompts and changes in the corresponding behavioral indicators in the subsequent learning unit. Our results show great variation between the effects of different feedback prompts, including effects in the intended direction, the reversed direction, and null effects. Implications for the use of feedback prompts will be discussed.

A Conceptual Framework of Learning Analytics Role in Feedback Practices in Higher Education
Keywords: Conceptual Change, Feedback, Higher Education, Learning Analytics
Presenting Author: Seyyed Kazem Banihashem, Open University, Department of Online Learning and Instruction, Netherlands; **Co-Author:**Omid Noroozi, Wageningen University and Research Centre, Netherlands; **Co-Author:**Stan van Ginkel, Universiteit Utrecht / Hogeschool Utrecht, Netherlands; **Co-Author:**Leah P. Macdadyen, The University of British Columbia, Canada; **Co-Author:**Harm Biemans, Wageningen University, Netherlands

AbstractPrevious studies have shown a great potential for learning analytics (LA) to support and enhance feedback practices, especially within higher education contexts. However, a few studies have tried to provide an comprehensive overview and a conceptual framework of LA role in supporting feedback activities to better guide future LA users for feedback purposes in higher education. This review study followed PRISMA method to review and analyze studies. In addition, we adopted a well-known LA model as a theoretical framework to report current state of LA role for promoting feedback practices in higher education and then we proposed a framework conceptualizing four dimensions of LA for feedback including who (stakeholders), why (objectives), what (types of data), and how (methods). The results of this study provide a clear picture of LA role in supporting feedback practices within higher education contexts and it can help with effective adoption of LA-based feedback. Furthermore, the results of this study can be used as a starting point for future empirical studies in LA-based feedback. Keywords: Feedback, higher education, LA-based feedback, learning analytics, review study

Does individual feedback on learning behavior derived from digital traces improve learning?
Keywords: Computer-assisted Learning, E-learning/ Online Learning, Feedback, Learning Analytics
Presenting Author: Carolin Hahnel, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Daniel Bengs, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Daniel Biedermann, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**George Ciordas-Hertel, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Beate Eichmann, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Julia Mendzheritskaya, Goethe-Universität Frankfurt, Germany; **Co-Author:**Julia Mordel, Goethe-University Frankfurt, Germany; **Co-Author:**Marc Winter, Goethe-University Frankfurt, Institute of Psychology, Germany; **Co-Author:**Monica Onofrei, Leibniz Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:**Ilka Wolter, Leibniz Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:**Cordula Artelt, Leibniz Institute for Educational Trajectories, Germany; **Co-Author:**Hendrik Drachsler, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Holger Horz, Goethe-University Frankfurt, Institute of Psychology, Germany; **Co-Author:**Frank Goldhammer, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany

We investigated the effectiveness of dashboard feedback on learning behavior in an asynchronous online course, comparing two groups of teacher students who received individualized feedback derived from digital traces of learning behavior (treatment group) or generic feedback based on historical data of an earlier cohort (control group). For both groups, the feedback covered aspects of self-regulated learning, learning engagement, and multiple document processing. The hypothesis that individual feedback leads to greater gains in an outcome performance measure and learning-related motivational aspects is tested using two-group SEM. Preliminary results indicate that overall gains in learning-related motivational aspects are found. However, the data does not support the hypothesis of greater performance gains in the treatment group.

Session R 15

26 August 2023 09:45 - 11:15
UOM_R05
Single Paper
Assessment and Evaluation, Higher Education, Teaching and Teacher Education

Teachers' (Mis)Conceptions and Judgements in the Classroom

Keywords: Achievement, Conceptual Change, Higher Education, In-service Teachers, Misconceptions, Motivation, Primary Education, Science Education, Teacher Professional Development
Interest group: SIG 03 - Conceptual Change, SIG 14 - Learning and Professional Development
Chairperson: Philipp Marten, Ruhr University Bochum, Germany

University teachers' conceptions on teaching and learning: a structural equation modeling study
Keywords: Conceptual Change, Higher Education, Misconceptions, Teacher Professional Development
Presenting Author: Neea Heinonen, University of Helsinki, Finland; **Co-Author:**Nina Katajavuori, University of Helsinki, Finland; **Co-Author:**Elina E. Ketonen, University of Helsinki, Finland; **Co-Author:**Mari Murtonen, University of Turku, Finland; **Co-Author:**Trang Nguyen, University of Turku / Faculty of Education, Finland; **Co-Author:**Ilona Södervik, University of Helsinki, Finland

The expertise in one's own subject knowledge has been one of the most respected features of a university teacher. In recent years, however, the need to improve university teachers' pedagogical awareness and education is acknowledged. This study aimed to investigate the relationship among university teachers' (mis)conceptions of teaching and learning, and the role of previous teaching experience and pedagogical studies in relation to teachers' (mis)conceptions were examined. Additionally, the effect of a short pedagogical training was investigated. A total of 127 life science university teachers from the University of Helsinki filled in a questionnaire, and a pre-test / post-test design was utilized. Data were analyzed using Structural Equation Modeling (SEM) and a paired t-tests. The results implicated that teachers who did not have previous pedagogical studies (PPS) had more transmissive beliefs compared to teachers with previous pedagogical studies. The paired t-tests revealed the potential effect of the pedagogical training on the development of teachers' conceptions of teaching and learning to a more constructivist direction. The findings provided evidence on the positive effect of the pedagogical training on fostering teachers' (mis)conceptions from more-traditional towards more-sophisticated direction. However, not everyone benefited from the training and further analysis with person-oriented approach will be made to examine the reasons affecting the phenomenon. Plausible explanations for the results and implications for theoretical and educational significance are also discussed.

Does irrelevant information reduce the quality of teacher judgments of student motivation?
Keywords: Achievement, Misconceptions, Motivation, Teacher Professional Development
Presenting Author: Jan Beck, Psychology of Learning in Education and Instruction, University of Münster, Germany; **Co-Author:**Stephan Dutke, Psychology of Learning in Education and Instruction, University of Münster, Germany; **Co-Author:**Till Utesch, Department of Educational Sciences, University of Münster, Germany

Teachers utilize information for motivation judgments inappropriately – commonly relevant information is ignored (Dicke et al., 2012) while irrelevant information is utilized (Brandmiller et al., 2020). We were interested if the mere availability of rather irrelevant information reduces utilization of relevant information when judging motivation. *N* = 150 pre- and in-service teachers judged eight fictitious students either based on relevant information (mastery goal orientation, and work avoidance; with three levels: "low", "average", or "high") or based on the same relevant information accompanied by gender (male; female) and academic

achievement (below-average; above-average). Prior to motivation judgments, participants' primary task was to remember student characteristics to assign students to heterogeneous working groups later. The intention was to simulate a realistic school setting in that participants needed to remember student information, but judged motivation after information was no longer available. Whereas participants utilized students' mastery goal orientations when solely relevant information were available (η^2 = .206), they neglected students' mastery goal orientations when irrelevant information was additionally available (η^2 = .023). Furthermore, academic achievement was utilized instead (η^2 = .157). These results show that academic achievement is a leading source of information for judging motivation even when motivation-relevant information is equally available. Thus, it should be discussed how to minimize the importance of academic achievement when teachers think of motivation as a central prerequisite for learning.

Understanding Teachers' Perceptions of Representations in Elementary Science Classrooms
Keywords: In-service Teachers, Primary Education, Science Education, Teacher Professional Development
Presenting Author: Cindy Hmelo-Silver, Indiana University, United States; **Co-Author:**Xintian Tu, Indiana University, United States; **Co-Author:**Joshua Danish, Indiana University, United States; **Co-Author:**Megan Humburg, Indiana University, United States; **Co-Author:**Meredith Park Rogers, Indiana University, United States; **Co-Author:**Adam Bell, Vanderbilt University, United States; **Co-Author:**Sarah Lee, Vanderbilt University, United States

Representations are essential to science education because they are central to science itself, and students need to be able to produce and interpret representations to engage deeply with scientific practices (Coleman et al, 2011). However, most research focuses on how learners engage with representations, with few studies exploring teacher understanding of their implementation. To support teachers in learning about using representations in elementary science classrooms, we designed the [Project], which includes professional development activities such as workshops and one-on-one coaching sessions. This paper explores teachers' perceptions of science representations and how the [Project] supports teachers in collaboratively building their practice of using representations in their elementary science classrooms. We analyzed eight participants' post-interviews and investigated how their understanding was formed through professional development workshops.

Session R 16

26 August 2023 09:45 - 11:15
UOM_R01
Poster Presentation
Assessment and Evaluation, Higher Education, Learning and Instructional Technology, Teaching and Teacher Education

Critical Thinking, Argumentation and (Pre)-Teacher Professional Development

Keywords: Argumentation, Cognitive Skills and Processes, Computer-supported Collaborative Learning, Critical Thinking, Digital Literacy and Learning, Higher Education, Inquiry Learning, Instructional Design, Pre-service Teachers, Primary Education, Problem Solving, Problem-based Learning, Qualitative Methods, Reasoning, Science Education, Teacher Effectiveness, Teacher Professional Development
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education, SIG 20 - Inquiry Learning, SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Ruud Lelieur, University of Antwerp, Belgium

Collaborative problem solving and online inquiry: Skills, processes and neural basis
Keywords: Cognitive Skills and Processes, Computer-supported Collaborative Learning, Digital Literacy and Learning, Problem Solving
Presenting Author:Päivi Häkkinen, University of Jyväskylä, Finland; **Co-Author:**Johanna Pöysä-Tarhonen, University of Jyväskylä, Finland; **Co-Author:**Shupin Li, University of Jyväskylä, Finland; **Co-Author:**Jarkko Hautala, Niilo Mäki Institute, Finland; **Co-Author:**Susannah Otieno-Leppänen, University of Jyväskylä, Finland; **Co-Author:**Otto Loberg, Bournemouth University, United Kingdom; **Co-Author:**Paavo Leppänen, University of Jyväskylä, Finland

In the current digital age, online inquiry and collaborative problem solving are among the critical competencies to be mastered. Our multi-disciplinary research project provides knowledge and explains differences in collaborative problem solving (CPS) and online inquiry (OI) as well as the related underlying processes. Participants are sixth-grade students (aged from 11 to 12 years), from urban and suburban environments in Finland. The research was conducted in interconnected, multidisciplinary studies varying from a large-scale assessment at classroom level to eye-tracking and neurocognitive studies. The project has combined social, cognitive and neural level research aiming at understanding the interactions of CPS and OI processes and skills across these different levels. In this poster presentation, we will highlight the main results of the project.

Critical thinking in teacher education: A systematic review
Keywords: Critical Thinking, Higher Education, Pre-service Teachers, Qualitative Methods
Presenting Author: Jarmila Bubikova-Moan, Oslo Metropolitan University, Norway; **Co-Author:**Leila Ferguson, Kristiania University College, Norway; **Co-Author:**Anette Andresen, Kristiania University College, Norway

Critical thinking (CT) is a notoriously illusive concept. Despite its complexity, CT has attracted much attention in recent years. A growing body of research has looked to teacher education and addressed the question of pre-service teachers' training in teaching CT. The aim of this systematic review was to shed light on these issues by asking: 1) How is CT and its teaching conceptualized in international scientific literature? and 2) How do preservice teachers themselves conceptualize CT? To address our research questions, we conducted a qualitative meta-synthesis of international research literature, initially searching the research databases ERIC and PsychINFO and supplementing this with hand search in thematically relevant reviews. This initial search gave a total of 1060 studies, the abstracts of which were screened according to selected inclusion criteria. The removal of duplicates and irrelevant studies then gave 498 studies which are included in the full-text review. Preliminary findings suggest that CT has become a buzzword with insufficient definitions and that it is used interchangeably with other concepts, such as problem-solving, creative thinking, and self-regulated learning by authors of scientific papers. Also, few of the studies investigated teachers' own conceptualization of critical thinking that attest to similar patterns as for RQ1. There also seems to be an assumption that teaching teachers to think critically about their own practice will automatically translate into a capacity to teach CT to their students. We will discuss the implications of our findings for an education in changing and uncertain times.

Argumentative design capacity: post-practice reflection, more than instruction, makes a difference
Keywords: Argumentation, Pre-service Teachers, Qualitative Methods, Teacher Professional Development
Presenting Author: Gabriel Fortes, Universidad Alberto Hurtado, Chile; **Co-Author:**Sylvia De Chiaro, Universidade Federal de Pernambuco, Brazil; **Co-Author:**Dayane Silva, Universidade Federal de Pernambuco, Brazil; **Co-Author:**Felipe Chaves, Universidade Federal de Pernambuco, Brazil; **Co-Author:**Nathalia Teofilo, Universidade Federal de Pernambuco, Brazil; **Co-Author:**Rodrigo dos Santos, Universidade Federal de Pernambuco, Brazil

Pedagogical design refers to the ability of teachers to recognize and use educational resources to compose activities to meet educational goals. Teaching, then, is designing because teachers are required to anticipate, adapt, and assess students content learning to different forms of instructional practice. When it comes to argumentation studies much attention has been put on learn to argue and argue to learn and recently learn to teach through argumentation, however, less has been investigated on how teacher plan to use argumentation in classrooms. To understand how progressive reformulations of classroom strategies, carried out from the subsequent analysis of their practices, can contribute to the development of the capacity of an argumentative pedagogical design, we analyze potentially argumentative strategies developed by teachers in training throughout a Development Program of 440 hours called "Pedagogical Residence" for Pedagogy undergraduates. In all, there were 29 undergraduate students who produced, in groups, several versions of an argumentative lesson plan (ALP). We carried a qualitative research to evaluate the ALP in three categories: 1) What (content related); 2) How (strategy related); and 3) Why, (post-practice reflection). The results indicate that pedagogical content-knowledge instruction was not enough for teachers to understand and design ALP, moreover, it is noticed that classroom practice was associated with increasing the argumentative potential of ALP through revisions, which proved to be a powerful tool of teachers' development design capacity. In this sense, we argue that argumentative pedagogical design capacity refers to practicing the potentiality of ALP and not just an abstract knowledge.

The influence of guidance and on-the-fly scaffolding in scientific inquiry
Keywords: Inquiry Learning, Instructional Design, Primary Education, Science Education
Presenting Author: Heide Sasse, RPTU Kaiserslautern-Landau, Germany; **Co-Author:**Miriam Leuchter, RPTU Landau, Germany; **Co-Author:**Timo Reuter, Rheinland-Pfälzische Technische Universität Kaiserslautern - Landau, Germany; **Co-Author:**Anke Maria Weber, University of Luxembourg, Luxembourg

Elementary school children differ in their ability to practice scientific inquiry processes (Schiefer et al., 2021). Some students need high guidance to accomplish scientific inquiry tasks, as in structured-inquiry, while others need low guidance, as in guided-inquiry (Parsons et al., 2018). However, to match the amount and type of guidance according to momentary students' needs teachers need support strategies, such as on-the-fly scaffolding (Corno, 2008; Van Leeuwen & Janssen, 2019). We conducted a pre-posttest design with 164 elementary school children (M = 9.9 years, SD = .66, 57 % female). We researched the influence of different sequential orderings of structured-inquiry and guided-inquiry with the aspect of on-the-fly scaffolding strategies. We measured the children's conceptual knowledge, process knowledge and science self-concept, as well as the perceived amount of on-the fly scaffolding. Mixed effects models revealed no differential learning effects depending on the order in which the children had guided-inquiry or structured-inquiry first. However, z-tests of proportions revealed that children were less likely to require a high amount of on-the-fly scaffolding strategies during guided-inquiry if they had guided-inquiry second. Furthermore, mixed-effects models showed that problematizing scaffolds are positively related to children's process knowledge. Our findings suggest that both structured-inquiry and guided-inquiry support children's science learning. However, different sequential orderings of high and low guidance influence children's autonomy during guided-inquiry. Furthermore, Scaffolds that stimulate deeper thinking processes have a positive influence on process knowledge.

Studying preservice teachers' evaluation of evidential support in arguments about educational topics
Keywords: Argumentation, Pre-service Teachers, Reasoning, Science Education
Presenting Author: Andreas Lederer, University of Erfurt, Germany; **Co-Author:**Eva Thomm, University of Erfurt, Germany; **Co-Author:**Johannes Bauer, University of Erfurt, Germany

When future teachers inform themselves about educational topics, they often come across diverse arguments including research-based and anecdotal evidence. In these situations, it is important to select reliable information and identify well-founded claims. While anecdotal evidence is frequently valued for its authenticity and practical implications, evidence of educational research can provide information based on systematic investigation and may therefore be more reliable in supporting claims about educational topics. Though both types of evidence are important resources to later professional practice, already pre-service teachers are shown to prefer anecdotal evidence. This study addresses pre-service teachers' evidence evaluation and examines whether they acknowledge differences in evidential support or maintain general preferences for anecdotal evidence though it may provide insufficient support for a given claim. To control for floor and ceiling effects due to training in research methods, we compare their evaluations with those of psychology. Accordingly, the experiment follows a 2x3 mixed design with the between-participant factor field of study (teacher education, psychology) and within-participant factor evidence type (anecdotal, correlational, experimental): Pre-service teachers and psychology students read arguments on educational topics that are supported by either anecdotal, correlational or experimental evidence. Participants assess their claim agreement, the convincingness of the argument and the strength of the evidential support. We expect pre-service teachers to agree more with anecdotal evidence, consider it to be more convincing and stronger evidential support than both scientific evidence and compared to psychology students. The findings contribute to recent research on pre-service teachers' reasoning and understanding of educational research.

Lessons learned from applying Project-Based Learning: The Educator perspective
Keywords: Inquiry Learning, Problem-based Learning, Qualitative Methods, Teacher Effectiveness
Presenting Author: Tina Papathoma, Code University of Applied Sciences, Germany

This study set out to answer the following research question: How do educators experience Project Based Learning (PjBL) in the context of teaching bachelor students of software engineering? To do this it touches upon theories of inquiry-based learning which places learners in the center, having control of their own learning. To this end, a case study was conducted with a focus on how educators applied PjBL with their bachelor students studying Software Engineering (SE). The data comprised 20 interviews with educators who were involved in four knowledge areas around SE. The interviews were thematically analysed. Preliminary findings show that PjBL can be an effective approach when combined with direct instruction. Educators' evidence also shows that it has been a challenge for some courses to approach them with PjBL. The findings can help institutions and educators to design better study programs applying PjBL. Drawing on this evidence, this study supports that PbL is a well needed approach that has the potential to bridge the gap between theoretical studies and the workplace however, it should not be the sole teaching approach but it should be combined with strong instructional teaching methods especially when dealing with novice learners.

Session R 17

26 August 2023 09:45 - 11:15
UOM_R02
Poster Presentation
Assessment and Evaluation, Cognitive Science, Instructional Design, Teaching and Teacher Education

Mathematics and Numeracy in Instruction and Assessment Research

Keywords: Achievement, Assessment Methods, Classroom Assessment, Cognitive Skills and Processes, Competencies, Cooperative/Collaborative Learning, Critical Thinking, Developmental Processes, Early Childhood Education, Instructional Design, Mathematics/Numeracy, Pre-service Teachers, Problem Solving, Quantitative Methods, Secondary Education, Teaching/Instructional Strategies
Interest group: SIG 01 - Assessment and Evaluation, SIG 03 - Conceptual Change, SIG 06 - Instructional Design, SIG 11 - Teaching and Teacher Education
Chairperson: Vanessa A. Völlinger, Justus-Liebig-Universität Giessen, Germany

Learning with multiple solutions - more promising in homogeneous or in heterogeneous teams?
Keywords: Cooperative/Collaborative Learning, Instructional Design, Mathematics/Numeracy, Problem Solving
Presenting Author: Cornelia S. Große, Johannes Kepler University Linz, Austria, Austria

Learning with multiple solutions in mathematics is promising in order to foster deep insight and understanding. However, it is often very difficult for students to generate just one solution, let alone more than one. The aim of this study is to investigate whether collaboration fosters the acquisition of modeling competencies, and whether learning in homogeneous or in heterogeneous teams is more promising. In an experiment, students learned alone, in homogeneous dyads, or in heterogeneous dyads, and they were prompted to generate one or multiple solutions in the learning phase (N = 193 seventh and eighth graders). Learning in homogeneous dyads was most beneficial with respect to the acquisition of modeling competencies. Being prompted to generate a second solution was beneficial only for learners with high prior knowledge; however, overall, generating multiple solutions had positive impact.

Evaluation of initial aritmetic skills: adaptation and validation study of TEMA-3
Keywords: Achievement, Assessment Methods, Early Childhood Education, Mathematics/Numeracy
Presenting Author:RAQUEL WEBER, Universidade Federal do Rio Grande do Sul, Brazil; **Co-Author:**Fabiana de Miranda Rocha Luna, Universidade Federal do Rio Grande do Sul, Brazil; **Co-Author:**Luciana Vellinho Corso, Universidade Federal do Rio Grande do Sul (UFRGS), Brazil; **Co-Author:**Amanda Oliveira Meggiato, Universidade Federal do Rio Grande do Sul, Brazil

The initial aritmetic skills are part of the number sense construct and its early evaluation is of fundamental importance since such competencies are strong predictors of later mathematical performance. This research aimed to adapt and validate the Test of Early Mathematics Ability (TEMA-3) to investigate the initial arithmetic abilities in Brazilian children. The pilot study included 204 children, between 3 and 8 years of age, from public schools of the state of Rio Grande do Sul, Brazil. The initial arithmetic abilities were evaluated by TEMA-3 and the Number Sense Brief (NSB), both translated into Portuguese. To verify the internal

structure of the instrument, a confirmatory factor analysis was performed. The reliability of the scale was verified, alongside tests of differences of means between genders, analysis of variance for difference of means between schools and Spearman correlations between the performance scores in the TEMA-3 and the other variables involved: age, mother's schooling, income, intellectual performance, and NSB performance scores. The results show the possibility of using the TEMA-3 for the evaluation of initial arithmetic abilities in Brazilian children, filling gaps in this context. This instrument showed the potential to become an important tool for diagnosing early difficulties in mathematics and to enable the development of appropriate intervention programs, seeking to minimize future difficulties in this area. The study has implications for the fields of research, education, and clinical practice.

Pre-service teachers' diagnostic competences: Development of accuracy, sensitivity, and specificity
Keywords: Competencies, Mathematics/Numeracy, Pre-service Teachers, Quantitative Methods
Presenting Author: Stephanie Kron, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Daniel Sommerhoff, Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Stefan Ufer, Ludwig-Maximilians-Universität (LMU), Germany

Even though diagnostic competences of (pre-service) teachers gain more and more research interest, evidence on the development of diagnostic competences is rare, in particular if different instructional conditions are compared. Moreover, diagnostic judgements are primarily investigated in terms of accuracy, meaning the match between a diagnosis and an independent diagnosis, for example measured by a standardized test. We suggest to separate diagnostic performance in terms of identifying students' misconceptions (sensitivity), from the diagnosis in terms of identifying students' competences (specificity).Aiming to investigate the development of diagnostic competences with a focus on performance measures, we conducted a longitudinal study based on simulated diagnostic one-on-one interviews, comparing a role-play and a video simulation format. We report data of pre-service mathematics secondary school teachers, who participated in one of the two presentation formats (role-play or video) four times, taking over the role of a teacher. Moreover, we investigated how accuracy, sensitivity, and specificity were related to participants' content knowledge and pedagogical content knowledge as assessed by written tests.Findings show that accuracy and sensitivity relate to participants' professional knowledge, leading to the question why higher professional knowledge does not support diagnosing students' competences (specificity) in particular. Acc uracy, sensitivity, and specificity increased over repeated participation in the simulation, but the development was not related to the presentation format of the simulation.

Assessing Critical Thinking of Mathematical Literacy
Keywords: Assessment Methods, Critical Thinking, Mathematics/Numeracy, Secondary Education
Presenting Author: Kai-Lin Yang, National Taiwan Normal University, Taiwan; **Co-Author:**Chien-Heng Chen, Taipei Municipal Dali High School, Taiwan; **Co-Author:**Wan-Rou Wu, National Taiwan Normal University, Taiwan; **Co-Author:**Yun-Zu Chen, Taipei Municipal Nanhu High School, Taiwan

Critical thinking, one higher-order thinking, has been increasingly emphasized in the information-rich age. Researchers recognize that critical thinking can be articulated and instilled in learning content knowledge (Ellerton, 2022). Programme for International Student Assessment (PISA) 2022 mathematical framework explicitly highlights critical thinking as one of eight crucial 21st century skills embedded in mathematical literacy (OECD, 2018). Accordingly, a framework for assessing critical thinking of mathematical literacy is beneficial to clarify the specific meaning of critical thinking in mathematics and to shed light on the development of mathematics literacy and itself. This study aims to propose a two-dimensional framework of assessing students' critical thinking of mathematical literacy and, based on the framework, design an online questionnaire for assessing students' critical thinking of quantitative literacy. The first dimension captures key components of critical thinking, which can not only keep the core features of critical thinking but also be differentiated from other skills. The other involves the three components of solving real-world problems in PISA mathematics framework. Exemplary test questions of the nine categories will be presented, and strategies to design test questions based on the framework will be provided. The framework contributes to an immersion approach, developing thinking skills naturally in disciplinary classrooms, to fostering critical thinking of mathematical literacy.

Screening early subitizing abilities in preschool classes – comparison of tests
Keywords: Assessment Methods, Classroom Assessment, Early Childhood Education, Mathematics/Numeracy
Presenting Author: Mona Holmqvist, Lund University, Sweden; **Co-Author:**Damon Tutunjian, Malmö university, Sweden; **Co-Author:**Catarina Wästerlid, Malmö University, Sweden

The focus in this study is methods for screening young children's, subitizing abilities. *Subitize* is in this project defined as identifying the number of things in a set simply by quickly looking at them and without counting them one by one. The aim of the study is to compare two different screening instruments for identifying children's subitizing abilities, individually and in groups of children, in a Swedish preschool class context. In total, data from 44 children is collected, who have taken one group test (Ability to Quickly See Quantity - AQSQ), and an individual test (Number Set Test - NST). The research question was if the children's results correlate with each other, or not, no matter of test conditions (individual/group). The results show a moderate to strong positive correlation, using Pearson and T-test Pair Samples Correlation (r=.559 p=

Solving word problem: the choice of an algorithm depends on non mathematical world semantics
Keywords: Cognitive Skills and Processes, Developmental Processes, Mathematics/Numeracy, Teaching/Instructional Strategies
Presenting Author: Jean-Pierre Thibaut, Université de Bourgogne / Lead - CNRS, France; **Co-Author:**Fatimah Alhashem, College of Arts & Sciences Gulf University for Science & Technology (GUST), Kuwait., Kuwait

The algorithms that are used in arithmetic problem solving do not depend on the nature of the objects that are featured in the problem. Combining sets of apples or sets of seconds rests on the same basic operations. In the present study, we suggest that the way people use algorithms might depend on the nature of the manipulated objects. We illustrate this claim with word distributive problems that can be solved either by factorization or by development. Our contention is that the strategy participants choose might on the semantic distance between the objects that are featured in the problem. 115 hundred fifth and sixth graders and 110 adults.
Design : Objects featured in the problems were from the same basic level category (apples and apples) or from distant superordinate categories (e.g. apples and computers). The other factor was the presence or absence of a structuring element (e.g. fruit baskets, or presents)Materials: Five experimental problems per condition and 5 filling problems.
Procedure: children were seen in their classroom and adults received and answered via internet (google forms).ResultsOverall, there was more factorizations in adults than in children and, importantly, a main effect of semantic distance (more factorization for apples and apples than for apples and computers). The solving procedure – factorization or development –depended on the semantic distance as close objects elicited more factorization than distant objects. Interestingly, the effect of semantic factors increased rather than decreased with age, thus are not correlated with a lack of competence.

Session R 18

26 August 2023 09:45 - 11:15
UOM_GYM
Roundtable
Educational Policy and Systems, Higher Education, Learning and Instructional Technology, Lifelong Learning

Cultural Diversity and Minority Students

Keywords: Cultural Diversity in School, Economics of Education, Educational Policy, Gender Issues, Higher Education, Lifelong Learning, Migrant / Refugee and Minority students, Mixed-method Research, Secondary Education, Self-efficacy, Self-regulated Learning and Behaviour, Social Aspects of Learning and Teaching, Teacher Professional Development, Teaching/Instructional Strategies, Tool Development
Interest group: SIG 06 - Instructional Design, SIG 14 - Learning and Professional Development, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Ulrich Ludewig, Institute for School Development Research, TU Dortmund University, Germany

Reducing Educational Inequality by Means of Equity Funding Policies? Findings from Germany
Keywords: Economics of Education, Educational Policy, Migrant / Refugee and Minority students, Mixed-method Research
Presenting Author: Denise Demski, Ruhr-University Bochum, Institute of Educational Sciences, Germany; **Co-Author:**Norbert Sendzik, Leibniz Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:**Marcel Helbig, Leibniz Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:**Gabriele Bellenberg, Ruhr-University Bochum, Institute of Educational Sciences, Germany

(Inter)national empirical findings repeatedly prove that both socioeconomic status and contextual factors at the level of the learning group, the school and the social space are decisive for educational opportunities. Equity funding policies might be an effective way to reduce educational inequalities. Following this approach, schools in challenging circumstances can receive additional staff, funding, or further support. However, empirical evidence of the effectiveness of this approach is rare. In Germany there are hardly any findings regarding the extent, the concrete design and the effects of equity funding schemes. In a current project funded by the German Federal Ministry of Education and Research we address these desiderata by (1) systematically analyzing and typologizing the different equity funding policies in the field of K-12 education in German municipalities and federated states, (2) conducting in-depth research of sensemaking processes of actors involved in these policies in four selected municipalities on the basis of interviews, and (3) analyzing the effects of equity funding in a quasi-experimental approach using difference-in-differences estimates. The design of our project, first results, and implications for policy and practice will be discussed in the roundtable.

Reducing gender segregated educational choices with pedagogical work life visits
Keywords: Gender Issues, Secondary Education, Self-efficacy, Tool Development
Presenting Author: Jenni Kunnari, University of Oulu, Finland; **Co-Author:**Satu Kaleva, University of Oulu, Finland; **Co-Author:**Kati Ilkka, City of Oulu, Finland; **Co-Author:**Hanni Muukkonen, University of Oulu, Finland

In many countries, education and work life is strongly segregated by gender (Van Soom & Donche, 2014) and, hence, it is needed to gain knowledge on how to encourage secondary education (SE) students to make educational choices atypical to their gender. In this project we aim to find new ways to implement work life visits by developing visit schemes, a web page as a communication tool, and training and preparatory material for school staff and the work life representatives. The representatives are, in terms of gender, selected for presenting counter stereotypical role models: females from ICT and males from education. We evaluate the effectiveness of actions taken in the project with pre- and postquestionnaires to be answered by the SE students and implement workshops for the counsellors, teachers, and work life representatives. In the roundtable session we will provide an insight to the latest results of our project, present our thoughts for developing work life visits, and lay a foundation for a discussion on research and developmental work on work life visits.

Promoting Intercultural Group Work: Lecturers' Strategies, Self-Regulation and Required Support
Keywords: Cultural Diversity in School, Higher Education, Self-regulated Learning and Behaviour, Teaching/Instructional Strategies
Presenting Author: Weiwei Li, University Groningen, Netherlands; **Co-Author:**Swati Vartak, University Groningen, Netherlands; **Co-Author:**Robert Coelen, University Groningen, Netherlands; **Co-Author:**Sabine Otten, University Groningen, Netherlands

AbstractResearch highlighted intercultural competence in students' preparedness for changing local and global environments in both personal and professional life. Although there is consensus surrounding the need for students to develop intercultural communication skills, there is a paucity of research exploring how educators can foster student intercultural learning. This study examines the teaching practices, beliefs and experiences of educators that foster student intercultural learning in cross-cultural group work, across a range of disciplines. It explores the characteristics of teaching that foster intercultural learning, and the influences on educator approaches. Semi-structured interview data from 19 lecturers were subjected to thematic analysis. The findings identified 4 types of teaching strategies used to foster intercultural learning in student groups. This study illuminates the conditions that support educators to foster intercultural learning, as well as the challenges they face. Educators' self-regulation, often made visible to students, played a key role in supporting students.

Individualising Swedish for Immigrants: Tensions and innovations in teachers' professional practice
Keywords: Lifelong Learning, Migrant / Refugee and Minority students, Social Aspects of Learning and Teaching, Teacher Professional Development
Presenting Author: Dimitrios Papadopoulos, University of Gothenburg, Sweden

Individualising processes in adult education contexts have emerged over several decades as all-embracing solutions to identified societal challenges. One such example is Municipal Adult Education in Swedish for Immigrants, in which key policy documents set individuals' needs and conditions as education's point of departure. SFI teachers are thus expected to enact innovative pedagogies in supposedly flexible educational frameworks which, nevertheless, provide limited margins of manoeuvre. The purpose of this paper is to examine the ways in which adult education teachers enact individualising processes in the context of SFI and the implications for their professional practice. Cultural-historical activity theory serves as the conceptual and theoretical framework of the study. Therefore, teachers' professional conduct is considered to be interwoven in networks of interactions between different stakeholders (e.g., principals, labour-market representatives, policy makers), which often have conflicting interests and expectations about SFI. The empirical base of the paper consists of individual and focus group interviews with SFI teachers from eight Swedish municipalities. Preliminary results show that tensions in the professional practice of SFI teachers result in the emergence of new pedagogical practices regarding individualising processes with immediate effects on the structure and content of the program.

Session R 19

26 August 2023 09:45 - 11:15
UOM_R08
Workshop
Higher Education

A Practical Approach to Authentic Assessment in Higher Education

Keywords: Assessment Methods, Creativity/Divergent Thinking, Higher Education, Instructional Design
Interest group: SIG 04 - Higher Education

Higher education in the post-COVID period faces significant challenges due to the pace of technological innovation and increased demands from governments and industry globally for job-ready graduates. The skills and knowledge expected from graduates have shifted and industry reports reveal a requirement for what have been described as '21st century skills' – collaboration; communication; Information and Communication Technology (ICT) literacy; and social and/or cultural competencies (Lai & Viering, 2012). Also, of note are creativity, critical thinking and problem-solving skills. Developing and evidencing these skills has proven to be a challenge for higher education institutions. One way to facilitate the evaluation of these desired skills is to ensure the learning activities and assessment tasks are 'authentic'.
A discussion relating to authentic assessment should necessarily consider constructive alignment (Biggs, 1996), which highlights the intrinsic link between learning outcomes (what the students should know or be able to do at the end of the learning) and the assessment tasks (the evidence of learning). Learning outcomes should be carefully crafted to include language that adequately describes the level of attainment required to demonstrate mastery and the degree of complexity required in the assessment task. In this workshop participants will be guided through discussion and activities that will enable them to use the principles of constructive alignment to identify and develop learning outcomes that facilitate authentic assessment activities and students' development of 21st century skills.

A Practical Approach to Authentic Assessment in Higher Education
Presenting Author: Debra McCormick, Monash University, Australia; **Presenting Author:**Nell Kimberley, Monash University, Australia

Higher education in the post-COVID period faces significant challenges due to the pace of technological innovation and increased demands from governments and industry globally for job-ready graduates. The skills and knowledge expected from graduates have shifted and industry reports reveal a requirement for what

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Session R 20

26 August 2023 09:45 - 11:15
AUTH_DC3
Workshop
Learning and Social Interaction

What is failure anyway? Dealing with uncertainty in (the replicability of) adaptive instruction

Keywords: Cognitive Skills and Processes, Emotion and Affect, Synergies between Learning / Teaching and Research, Teaching/Instructional Strategies
Interest group: SIG 10 - Social Interaction in Learning and Instruction

Adaptive face-to-face instruction, support provided at the point of need, is often mentioned as an important feature of good teaching. Although adaptive teaching is considered effective, empirical evidence of its effectiveness is scarce and weak. A possible reason for this scarcity might arise from a lack of clarity about the ways in which adaptivity is conceptualized, operationalized and analyzed. Research literature about adaptive instruction has focused on various dyadic behaviors that might be viewed as *related* behaviors or *responsive* behaviors or a combination of both. A replication study is a well-suited research design to address possible (un)clarities in our current understanding of adaptive instruction. Our preregistered replication study tests whether contingent instruction, a specific conceptualization and operationalization of adaptive instruction, can be carried out by trained tutors and whether claims about the effectiveness of the contingent instruction still hold. Contingent instruction in this study was operationalized as intervening at the point of failure. Whenever a child failed, the tutor had to provide more support, whenever the child succeeded, the tutor had to offer less support. The judgment of what constitutes failure resulted in a fundamental debate about the question: what is failure to teach adaptively or failure to replicate anyway? This workshop will address and explore the role of uncertainty and imprecision in human judgment in educational research.

What is failure anyway? Dealing with uncertainty in (the replicability of) adaptive instruction
Presenting Author: Nienke Smit, Utrecht University, Netherlands; **Presenting Author:**Renske de Kleijn, UMC Utrecht, Netherlands; **Co-Author:**Jelte Wicherts, Tilburg University, Netherlands; **Co-Author:**Janneke van de Pol, Utrecht University, Netherlands

Adaptive face-to-face instruction, support provided at the point of need, is often mentioned as an important feature of good teaching. Although adaptive teaching is considered effective, empirical evidence of its effectiveness is scarce and weak. A possible reason for this scarcity might arise from a lack of clarity about the ways in which adaptivity is conceptualized, operationalized and analyzed. Research literature about adaptive instruction has focused on various dyadic behaviors that might be viewed as *related* behaviors or *responsive* behaviors or a combination of both. A replication study is a well-suited research design to address possible (un)clarities in our current understanding of adaptive instruction. Our preregistered replication study tests whether contingent instruction, a specific conceptualization and operationalization of adaptive instruction, can be carried out by trained tutors and whether claims about the effectiveness of the contingent instruction still hold. Contingent instruction in this study was operationalized as intervening at the point of failure. Whenever a child failed, the tutor had to provide more support, whenever the child succeeded, the tutor had to offer less support. The judgment of what constitutes failure resulted in a fundamental debate about the question: what is failure to teach adaptively or failure to replicate anyway? This workshop will address and explore the role of uncertainty and imprecision in human judgment in educational research.

Session R 21

26 August 2023 09:45 - 11:15
UOM_A11
ICT Demonstration
Assessment and Evaluation

Yellow-Red: Playful Tablet based executive function test for children between 6 and 12

Keywords: Assessment Methods, Classroom Assessment, Cognitive Development, Cognitive Skills and Processes
Interest group: SIG 01 - Assessment and Evaluation

Please bring your own device if you are attending this ICT demonstration.Executive Functions are psychological processes of great importance for the proper functioning in various areas of human development, including academic performance. For this reason, from both clinical and educational perspectives, there is great interest in how they are assessed. This ICT will show Yellow-Red, an instrument for directly assessing executive functions in children between 6 and 11 years of age, in a playful format using a digital support. The test is based on a 3-factor model of executive functioning: Inhibition, Working Memory, and Cognitive Flexibility. Yellow-Red comprises six subtests: cognitive inhibition (2), behavioral inhibition (1), working memory (2), cognitive flexibility (1). The ICT will focus on showing in detail the six subtests of the test, learning how to interpret individual reports and learning how to access the tool free of charge for research purposes. The test is standardised for Chile, is in the process of being standardised for Germany and has versions in Norwegian, Hungarian, Romanian, Chinese and English.

Yellow-Red: Playful Tablet based executive function test for children between 6 and 12
Presenting Author: Ricardo Rosas Diaz, CEDEti-UC, Chile; **Co-Author:**Catalina Santa Cruz, Centro de Justicia Educacional, Chile; **Co-Author:**Victoria Espinoza, CEDETi-UC, Chile; **Co-Author:**Camila Martinez, Pontificia Universidad Católica de Chile, CIE 160007, Chile

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Session R 22

26 August 2023 09:45 - 11:15

UOM_A10
ICT Demonstration
Teaching and Teacher Education

Animated videos in social science didactics for pre-service teacher education

Keywords: Social Sciences and Humanities, Teacher Professional Development, Tool Development, Video-based Learning
Interest group: SIG 11 - Teaching and Teacher Education

Please bring your own device if you are attending this ICT demonstration.Social Science teachers must develop professional skills to arrange learning opportunities that foster political literacy among students. There is growing evidence that the usage of videos in university teacher education is beneficial to the pedagogical knowledge and the professional vision of pre-service teachers. There is however a severe lack of studies on video usage in Social Science teacher education and its effects on professional development, not least because there are even less freely accessible video resources of civic education lessons. As part of a joint research project, we developed 22 animated videos of civic education lessons based on authentic video recordings, with the goal to close this gap in supply of freely accessible videos of civic education lessons and to strengthen the theory-practice link in university teacher education. Each video is fully subtitled in English language, created barrier-free and published open access. As the first freely accessible video representations of authentic North-Rhine-Westphalian civic education lessons, our videos open up a wide range of research questions, e.g. regarding a potentially domain specific professional vision of Social Science teachers or the effects of a video-based learning environment on the pedagogical content knowledge of pre-service teachers. We demonstrate how to use animated videos and related learning tasks in higher education seminars to foster the professional vision of pre-service teachers.

Animated videos in social science didactics for pre-service teacher education
Presenting Author: Frederik Heyen, University of Duisburg-Essen, Germany; **Co-Author:**Sabine Manzel, Universität Duisburg-Essen, Germany

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Session S 1

26 August 2023 12:00 - 13:30
UOM_CH
Invited Symposium
Teaching and Teacher Education

Non-Convincing Effects in Research on Teaching Quality: Reasons and Possible Solutions

Keywords: Quantitative Methods, Teacher Effectiveness, Teaching Approaches, Teaching/Instructional Strategies
Interest group: SIG 18 - Educational Effectiveness and Improvement
Chairperson: Charalambos Charalambous, University of Cyprus, Cyprus
Chairperson: Anna-Katharina Praetorius, University of Zurich, Switzerland
Discussant: Alexander Renkl, University of Freiburg, Germany

Past educational effectiveness research has been successful in empirically corroborating the role of teaching for student learning and uncovering teaching dimensions conducive to this learning. Yet, a critical inspection of this body of work suggests that the effects of different dimensions of teaching quality on student learning are neither very consistent nor very convincing in terms of effect sizes (cf. Evans & Yuan, 2022; Scheerens, 2016). In this symposium, we therefore ask: *What is contributing to the often small or even nonexistent effects obtained when trying to link teaching quality to student learning? What can be done in the future to address this challenge?* To systematically address these questions, the four papers in this symposium offer four complementary angles to do so. The first paper (Muijs et al.) explores how conceptualizing teaching quality contributes to such findings. Focusing on the learning outcomes, the second paper (Vieluf et al.) questions the alignment between how teaching quality and learning outcomes are conceptualized. The third paper (Praetorius et al.) identifies several potentially important contextual factors and illustratively discusses how two (subject matter and classroom composition) might be contributing to the non-convincing findings. The fourth paper (White et al.) explores how current measurement approaches might be contributing to such findings. As a whole, the four papers highlight potential reasons for the non-convincing findings and offer possible solutions for addressing this problem that lend themselves to redirecting future research in this field.

Conceptualizing Teaching Quality: Problems, Prospects and a Proposed Way Forward
Presenting Author: Charalambos Charalambous, University of Cyprus, Cyprus; **Co-Author:**Daniel Muijs, Queen's University Belfast, United Kingdom; **Co-Author:**Ariel Lindorff, University of Oxford, United Kingdom

Empirical studies of the contribution of teaching quality to student learning have often found only small effects. In this paper we argue this is at least partly due to how teaching quality has been conceptualized in teacher effectiveness research (TER). We propose four factors that, if addressed, could contribute to more convincing and substantial findings in TER in the future. These factors are: 1) existing difficulties and dilemmas in defining teaching and its quality; 2) current approaches to conceptualizing teaching quality; 3) a narrow perspective on content and context; and 4) restrictions on current conceptualizations of teaching quality due to limited conceptualizations of student learning. We propose that more collaborative work in the future and a broadening of current conceptualizations of teaching quality will contribute towards addressing some of these open issues.

Challenges in Conceptualizing the Outcomes and the Linkage between Outcomes and Teaching
Presenting Author: Svenja Vieluf, Technische Universität Braunschweig, Germany; **Co-Author:**Alexander Naumann, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Kirsti Klette, University of Oslo, Norway

This paper addresses the conceptualization of (a) the outcomes and (b) of the linkage between teaching and outcomes in teaching effectiveness research. Conceptualization is of central relevance in the critical rationalist paradigm, as it links theory with empirics. In particular, the outcomes and the linkage between teaching and the outcomes need to be rigorously conceptualized, because the teaching effectiveness paradigm rests on two assumptions: First, teaching is considered effective when normatively defined outcomes are observed. Second, it is assumed that learning outcomes can be explained by teaching. With regard to both, the conceptualization of the outcomes and the conceptualization of their linkage with teaching, considerable advances have been made during the past decades, but also several challenges remain. In particular, research is challenged by the multiplicity of relevant learning outcomes, a lack of justification for the outcome-choices made within each study, a lack of agreed-upon nominal definitions of these outcomes, insufficient alignment of nominal and operational definitions, and study designs that do not allow for modeling the whole theoretically assumed complexity of the causal link between teaching and learning. Our presentation will discuss these challenges using examples from empirical teaching effectiveness studies, discuss how these issues might be resolved and point to future research directions.

Context Effects in Teaching Quality Research: Bringing a Complex Term Into Focus

Presenting Author: Anna-Katharina Praetorius, University of Zurich, Switzerland; **Co-Author:**Benjamin Fauth, Institute for Educational Analysis and University of Tübingen, Germany; **Co-Author:**Armin Jentsch, University of Oslo, Norway; **Co-Author:**Stefan Keller, Zürich University of Teacher Education, Switzerland

Contextual variables are highly relevant for research on teaching quality as they might influence empirical findings and thus hamper the validity of studies. The most frequently mentioned are content, class composition, school type, curriculum, and national particularities. Referring to the instructional triangle, we focus on content and class composition as two particularly important elements of teaching quality in this paper. First, we summarize empirical evidence on the relevance of content and student composition for teaching quality. Second, we discuss the challenges of treating them as contextual variables, arguing that two elements which form an integral part of teaching quality cannot at the same time be considered a contextual variable. Instead, we suggest that future research should focus on the interplay between teachers, students and content to do justice to the complexity of teaching quality. We end by discussing the implications for our argument for future studies in this field.

Measuring Teaching Quality: Dilemmas and Tradeoffs
Presenting Author: Richard Goellner, University of Tuebingen, Germany; **Co-Author:**Mark WHite, University of Oslo, Norway; **Co-Author:**Thilo Kleickmann, Kiel University, Germany

Research has highlighted many complexities in the measurement of teaching quality. These complexities provide one explanation for the low and inconsistent correlations between measures of teaching and learning. This presentation discusses dilemmas and tradeoffs in the measurement of teaching quality. These dilemmas exist in the way that teaching quality is operationalized, in the choice of raters, and in the unit of analysis. Balancing these dilemmas is necessary to align measurement approaches to study goals. No measurement of teaching could ever be perfect. Rather, there is a need to clearly identify one's priorities to guide decisions that balance between the dilemmas and tradeoffs highlighted here. The explicit discussion of the dilemmas that we discuss here will help support researchers in doing this.

Session S 2

26 August 2023 12:00 - 13:30
AUTH_DC3
Invited Symposium

Creative, inclusive and equitable play and learning environments: Children's participation in focus

Keywords: Art Education, At-risk Students, Attitudes and Beliefs, Creativity/Divergent Thinking, Early Childhood Education, Gifted and Talented Students, Inclusive Education, Pre-service Teachers, Social Development, Special Education, Sustainable Development, Teaching Approaches, Well-being
Interest group:
Chairperson: Heidi Harju-Luukkainen, University of Jyväskylä, Finland
Chairperson: Eva Staffans, Finland
Discussant: Eva Staffans, Finland

Participation, a fundamental right of all children, is prominent in Nordic discussions regarding early childhood education and care (ECEC). The concept is evident in Nordic policy, steering documents and curricula. Planning for children's participation should be intentional, and opportunities created for children to share voice and to influence. The Nordic countries have a strong commitment to the UN Convention on the Rights of the Child; articles 12, 13, 14 and 15 have particular relevance for this symposium. Complexity surrounding the phenomenon of children's participation seems to be universal across studies. However, there are some general aspects that our collective research highlights, including that relationship between teacher and child are crucial for children's participation and engagement and hope for the future. Furthermore, marginalised children including those with special educational needs are more vulnerable than children are in general and might have challenges in participation and getting their voices heard. Striving for equitability among all children is a demanding task for teachers and they need to be aware of effects arising from their way of supporting, allowing or denying children to express themselves. The present symposium aims to highlight and discuss children's participation from differing angles and perspectives. We share studies that span early childhood centres, community settings, and examination of guiding documents. The contributions are from Finland, Norway and Sweden.

CANCELLED: Young children's participation and voices in city planning
Presenting Author: Terese Wilhelmsen, University of South-Eastern Norway, Norway; **Co-Author:**Steinar Ovreas, University of South-Eastern Norway, Norway; **Co-Author:**Simen Thorrud, University of South-Eastern Norway, Norway; **Co-Author:**Hege Roll-Hansen, University of South-Eastern Norway, Norway; **Co-Author:**Anne-Line Bjerknes, University of South-Eastern Norway, Norway

Scarce knowledge exists on how to involve the youngest children in city planning. The aims of this study were to develop, test and research methods to promote young children's interests, participation, and voices in city planning. The project is based on a collaboration between a municipality and researchers. The theoretical frame incorporates children's rights perspectives and research on child-friendly environments considering children's independent mobility and affordance. We used a multi-method and multi-perspective approach. The participants were children (aged 3-6), parents (14), and early childhood education (ECE) teachers (N=3) from three ECE institutions. Teacher students acted as co-researchers and, together with ECE teachers, involved three groups of children in exploration of available play areas and children's wish for improvement of the areas with the use of guided tours, field conversations, drawing and constructive play. Parents participated by marking on a map their preferred places to play and walk in the neighbourhood with their children, and a structured survey was used to identify what the parents liked and disliked about their neighbourhood, and their wishes for further development. The project was approved by the Norwegian Center for Research Data. In the presentation we discuss five main characteristics of good play areas as emphasized by children and parents: 1) allowing creative and challenging play, 2) safety, 3) green city lungs, 4) area for the whole family, and 5) child friendly transitions between areas.

Teachers' perspectives on children's creativity in Swedish preschools
Presenting Author: Valerie Margrain, Karlstad University, Sweden; **Co-Author:**Alexandra Guseva, Karlstad University, Sweden

Though widely accepted, the notion of creativity is often misinterpreted and, regarding the educational context, unreflected by the practitioners, which potentially restrains pedagogical practice. The aim of this study is to explore teachers' perspectives on children's creative participation in Swedish preschools as well as to contribute to the broader understanding of creativity as a social constructed notion. Csikszentmihalyi's (2006) system model for creativity is used as the theoretical framework for the study with some adjustments made to be applicable to the preschool context. Four preschools in the middle of Sweden are participating in the study. The project includes focus group interviews with 4-6 participants from the same preschool in each group. After the first focus group interviews the practitioners were encouraged to digitally write down their reflections about children's creative participation observed in their preschool practice. The reflections were then followed up in a second meeting of the focus groups. Analysis of the material gathered during the focus group interviews focused on the relationships and tensions between the preschool as a domain, practitioners as experts and children as creative individuals. The study is part of current doctoral research conducted and approved by Karlstad University in Sweden. The findings of the study are expected to contribute to a broader understanding of creativity in Swedish preschool contexts and therefore provide some guidance on the development of pedagogical practice.

Participation and inclusion on the margins: Disabled and gifted children in ECE
Presenting Author: Valerie Margrain, Karlstad University, Sweden

Participation, a fundamental right of all children, is prominent in Nordic discussions regarding early childhood education and care (ECEC). The concept and hope is evident in Nordic policy, steering documents and curricula, including the UN Convention on the Rights of the Child. Although there is a strong commitment to children's participation in ECE, this is problematic for at-risk and marginalised children. In this presentation parallels are drawn between the needs and rights of those with disabilities, and the needs and rights of gifted children. For both groups it is important to engage in early identification, observe and get to know the children, to create a supportive and responsive learning environment, to utilise partnership with parents, and to differentiate the curriculum. Striving for equitability among all children is a demanding task for teachers and they need to be aware of effects arising from their way of supporting, allowing or denying

children to express themselves. This study is guided by ecological systems theory. The Swedish data shared will include a document analysis of policy and steering documents, interview data and family records. Within the document analysis, recent curriculum updates highlight concepts of 'an equitable education', and appropriate stimulation opportunities in their learning. Parallels from case study data of a gifted child and a child with disability are presented, with findings of these case studies highlighting the importance of respect, openness and flexibility to facilitate participation. Barriers to participation include misunderstanding, financing and normativity.

Early childhood education teachers' views on children's participation during transitions
Presenting Author: Eva Staffans, Faculty of Education and Welfare Studies, Vasa, Finland; **Presenting Author:**Johanna Hirvi, Åbo Akademi University, Faculty of Education, Finland; **Presenting Author:**Kaisa Pihlainen, University of Eastern Finland, Finland

Children's learning path starts in the early years and during this time, children take part in several educational transitions, such as transitions from early childhood education and care (ECEC) to preschool classes or to comprehensive school or transitions within ECEC settings within different groups of children. Children with special educational needs (SEN) might experience these transitions to be more challenging. The aim of this paper is to examine how teachers perceive and offer children with SEN a voice during educational transitions. Data is collected via an online questionnaire in autumn 2022 and analysed using content analysis. The descriptive comparison allowed similarities and differences between teacher's approaches to appear. The preliminary results indicate that there are differences in teachers' views on possibilities of children with SEN to participation during educational transitions. The paper concludes with a broader discussion on steering documents in early childhood education and care regarding children with SEN and their right to participate in decisions affecting their learning path.

Session S 3

26 August 2023 12:00 - 13:30
UOM_A03
Symposium
Teaching and Teacher Education

New Theoretical and Methodological Perspectives on Teacher Professional Vision

Keywords: Cognitive Skills and Processes, Communities of Learners and/or Practice, Competencies, Eye Tracking, In-service Teachers, Learning Analytics, Pre-service Teachers, Qualitative Methods, Social Aspects of Learning and Teaching, Teacher Professional Development, Teaching/Instructional Strategies, Video-based Learning
Interest group: SIG 11 - Teaching and Teacher Education
Chairperson: Rebekka Stahnke, Leibniz Institute for Science and Mathematics Education, Germany
Discussant: Thorsten Scheiner, Australia

In recent years, the majority of studies on teacher professional vision took a cognitive perspective by investigating how teachers identify important aspects of a situation and how they make sense of what they notice. These studies often asked individual teachers to analyze video excerpts and state their thoughts in interviews or more or less standardized written surveys (König et al., 2022). However, to gain new insights that can support the design of teacher education and professional development innovative theoretical and methodological perspectives are needed. This symposium presents two contributions on new theoretical ideas as well as two contributions demonstrating the potential of new methodologies. The first contribution proposes returning to Goodwin's (1994) notion of professional vision by considering not only the cognitive, but also the social and political aspects of professional vision. The second contribution presents a new model of visual expertise, called the cognitive theory of visual expertise, that can be used to analyze the professional vision of expert teachers. In the third contribution, preservice teachers' weaknesses and strengths regarding their professional vision are analyzed with epistemic network analysis, a novel tool from quantitative ethnography. The final contribution demonstrates the potential of discourse analysis as a new method for research on teachers' learning to notice in professional development courses. The contributions presented in the symposium broaden both theoretical and methodological perspectives with the aim to develop a deeper understanding of the cognitive but also the social and political dimensions of professional vision.

Professional Vision and Teacher Noticing: Different pieces of the same puzzle?
Presenting Author: Jennifer Richards, Northwestern University, United States; **Co-Author:**Miriam Sherin, Northwestern University, United States; **Co-Author:**Sarah Larison, Northwestern University, United States

One perspective that intrigues us is the use of "teachers' professional vision" to describe teacher noticing. From the start, the notion of professional vision, introduced by anthropologist Charles Goodwin (1994), appeared to have powerful implications for teaching. It seemed that use of the term could help distinguish "everyday noticing" from the work of "professional noticing." In addition, professional vision highlighted the importance of considering noticing with regards to the phenomena of interest to a given profession. This prompted a focus on how teachers see and make sense of classrooms and the cognitive resources used to do so. Yet, studies of teachers' professional vision did not typically emphasize the collaborative, social nature of professional vision, nor the ways in which professional vision is connected to broader political considerations — both central aspects for Goodwin. Here, we revisit the notion of professional vision and explore its relationship to teacher noticing. In particular, we consider what differences between these constructs might mean for our understanding of what is involved in teacher noticing and in learning to notice.

Towards a Cognitive Theory of Visual Expertise: Methods of Inquiry
Presenting Author: Andreas Gegenfurtner, University of Augsburg, Germany; **Co-Author:**Hans Gruber, University of Regensburg, Germany; **Co-Author:**Doris Holzberger, Technical University of Munich (TUM) & ZIB (Centre for International Student Assessment), Germany; **Co-Author:**Özün Keskin, University of Augsburg, Germany; **Co-Author:**Erno Lehtinen, University of Turku, Finland; **Co-Author:**Tina Seidel, Technische Universität München, Germany; **Co-Author:**Kathleen Stürmer, Univerity of Tübingen, Germany; **Co-Author:**Roger Saljo, University of Gothenburg, Sweden

A cognitive theory of visual expertise is proposed to model the visual information processing of domain experts. During theory development, we integrated empirical evidence from multiple methods of inquiry—including qualitative observations, qualitative interviews, eye tracking, and neuroimaging—used in research on learning and instruction in the professions. Devoted to understand expert teachers' skilled perception, interpretation, and evaluation of visual information in schools and classrooms, the theory is based on three underlying assumptions: extended capacity, knowledge-based processing, and practice-based interaction. The professional vision of expert teachers is described as a set of eight processes in the visual register and long-term working memory; these processes are selecting visual information, ignoring visual information, knowledge-based noticing, extending the visual field through parafoveal processing, organizing image chunks, integrating, using visual practices to interact with the environment, and monitoring. We discuss educational and methodological implications of the theory as they relate (a) to the expertise development of pre-service teachers through training and deliberate practice in real and virtual classrooms and (b) to the use of mixed methods when studying teacher professional vision.

Visualizing Preservice Teachers' Descriptions of Noticed Tutoring Events with Epistemic Networks
Presenting Author: Meg Farrell, Technische Universität München, Germany; **Co-Author:**Monika Martin, University of Education Freiburg, Germany; **Co-Author:**Alexander Renkl, University of Freiburg, Germany; **Co-Author:**Werner Rieß, PH Freiburg, Germany; **Co-Author:**Karen Könings, Maastricht University, Netherlands; **Co-Author:**Jeroen Van Merrienboer, Maastricht University, Netherlands; **Co-Author:**Tina Seidel, Technische Universität München, Germany

Practice-based teacher education calls for application opportunities to learn core teaching practices, like professional vision (PV). This multidimensional skill of attending to (i.e., noticing) important teaching and learning moments and using professional knowledge to make sense of them (i.e., reasoning) for further action, can be facilitated with video-based training. To better understand the strengths and deficits of preservice teachers' PV within the setting of another core practice, small-group tutoring instruction, the present study investigated the video analysis responses of 41 preservice teachers participating in a 90 min. video analysis training in this context. We examined their PV skills in describing noticed events by analyzing their written responses on significant content (i.e., actors, topics) and quality (i.e., level of information sophistication) indicators informed by PV literature. After evaluating their skills with descriptive statistics, we used,

epistemic network analysis (ENA), a novel tool from Quantitative Ethnography, to further investigate the interconnected structure of preservice teachers' descriptions of noticed events. Findings indicated that most preservice teachers noticed aspects of the tutor and his/her general pedagogical strategies at a vague level, while content-specific strategies were noticed less often. With ENA, we observed the frequent co-occurrence of the tutor, general pedagogy, and group of students within most responses, as well as a small cluster of participants with a content-specific and dialogic instructional focus. These findings speak to the added value of ENA to demonstrate complex, multifaceted relationships within PV skills, and help to illuminate areas of proficiency and needs for support from multiple grain sizes.

CANCELLED: Teacher Noticing Discourse: Understanding Mechanisms of Teacher Learning
Presenting Author: Elizabeth van Es, University of California, Irvine, United States; **Co-Author:**Melissa Luna, West Virginia University, United States; **Co-Author:**Miray Tekkumru-Kisa, Florida State University, United States

This presentation has been cancelled and will not be presented at the EARLI conference.Professional development focused on the analysis of artifacts of practice can support teachers developing their noticing of student thinking to enact responsive practices in the classroom. This study examines whether and how the discourse structure in video-based professional development supports changes in teachers' noticing of student thinking for responsive teaching. Informed by situative learning theory, we conducted a discourse analysis of participants' talk in a video-based professional development context, as well as teachers' discourse in whole class and small-group discussions. This analysis resulted in identifying four features of generative talk for teacher learning and noticing, that we describe as a *Noticing Discourse*. We propose that teacher learning constitutes developing discursive practices that embody building awareness of and inquiry into students' thinking and support teachers learning to attend to and interpret the substance of students' thinking. These findings have implications for how we theorize teacher learning in professional development and for designing and studying professional development that is generative for teacher and student learning.

Session S 4

26 August 2023 12:00 - 13:30
AUTH_DC1
Symposium

Climate change – addressing knowledge, action and hope

Keywords: Attitudes and Beliefs, Conceptual Change, Curriculum Development, Educational Policy, Emotion and Affect, Engagement, Environmental Education, Goal Orientations, Reasoning, Science Education, Secondary Education, Social Sciences and Humanities, Teaching/Instructional Strategies
Interest group: SIG 03 - Conceptual Change
Chairperson: Cecilia Lundholm, Stockholm University, Sweden
Organiser: Cecilia Lundholm, Stockholm University, Sweden
Discussant: Gale Sinatra, University of Southern California, United States

The aim of the symposium is to address the climate crises, knowledge, action and coping, and education. The papers report empirical findings of students' conceptions and learning about climate change, causes and actions, and curricula supporting action and hope, including research from Australia, Sweden and the US. The symposium aligns with the conference title 'Education as Hope in Challenging Times'. The first paper shows that adolescent students who engaged in more autonomy-supportive instruction had greater levels of scientific reasoning than those who engaged in less-autonomy supportive instruction, suggesting that student agency to think and reason about the climate crisis can be facilitated. The second paper presents results on how senior high-school students cope with conflicts when trying to live in a climate-friendly way. Results show both constructive and less constructive ways of coping. In alignment with a focus on climate and action, the third paper report results of 15–17-year-olds students' conceptions of actions, such as policy support, to mitigate climate change in relation to how they conceptualize causes to climate change, and effectiveness of policies (tax, subsidies, legislation and bans). The fourth paper presents insights on whether subject domains curricula for year 16-19 offer sufficient scaffolds and affordances for teachers to develop students' understandings, skills and values regarding climate change with an example from Victoria, Australia. The findings are relevant for education and teaching as the papers address curricula support, and instruction for learning about climate change, climate polices, and instruction which promotes constructive coping strategies.

Scaffolded Instruction to Facilitate Learning about the Climate Crisis and Extreme Weather
Presenting Author: Doug Lombardi, University of Maryland, College Park, United States; **Co-Author:**John Robertson, University of Maryland, United States; **Co-Author:**Nancy Gans, University of Maryland, College Park, United States; **Co-Author:**Joshua Jaffe, University of Maryland, United States

Making scientific connections between extreme weather events and the climate crisis is a considerable learning challenge. Instructional scaffolds, such as Model Evidence Link (MEL) diagrams, can help students with complex, scientific reasoning, thereby facilitating learning about these topics. However, questions remain about how to facilitate students' deep learning such that they can use their knowledge outside the classroom context (i.e., increasing students' autonomy to act scientifically in the face of climate change). In this quasi-experimental study, we compared two different forms of the MEL scaffold models in terms of students' levels of scientific evaluations, plausibility shifts toward the scientific, and knowledge gains about the connections between extreme weather events and climate change. Results revealed that the more autonomy-supportive MEL model facilitated greater levels of evaluation and stronger plausibility shifts, with both scaffold forms resulting in knowledge gains. Overall, the results suggest that more autonomy supportive scaffolding may deepen students' scientific thinking and knowledge to facilitate their actions on the climate crisis.

CANCELLED: Promoting action competence and hope in education for a sustainable future
Presenting Author:MARIA OJALA, Örebro University, Sweden

Many young people experience helplessness concerning the global future and problems like climate change. At the same time, it is vital that the young generation becomes prepared for taking part in the societal transformation that is needed to handle different sustainability problems. Hope and action competence are therefore vital to promote in education. According to hope theorist Snyder, hope consists of the ability to set up clear goals, to come up with pathways to reach these goals, and to be able to motivate oneself to use these pathways, i.e., agency thinking. This survey study focuses on one pathway to fight climate change, namely, to make climate-friendly food choices. The focus is on how senior high-school students (mean-age 17.9 years; N=474) cope with conflicts experienced in relation to climate-friendly food choices. In a theoretical sense this coping is seen as agency thinking in line with Snyder's hope theory. The empirical aim is to explore how ways of coping relate to climate-friendly engagement, behavioral intention, outcome efficacy, reported knowledge, and climate-change hope, all vital aspects of action competence. The result shows that to cope through dialectical thinking is positively related to all these aspects, while black-and-white thinking, another way to cope, is negatively related to the same aspects. The theoretical aim is to discuss these results in relation to theories about experiential learning and educating for action competence in educational science. It is argued that it is vital to in education promote constructive coping strategies and to critically discuss non constructive ones.

Understanding the role of knowledge and action in combating climate change
Presenting Author: Cecilia Lundholm, Stockholm University, Sweden; **Co-Author:**Anna Bendz, University of Gothenburg, Sweden; **Co-Author:**Caroline Ignell, Stockholm University, Sweden

Previous research in environmental education has called for attention to the impact of knowledge on action, where action is seen as 'direct' and 'indirect' (Kollmuss & Agyeman 2002). Indirect action is for example supporting climate policies that lead to change of behaviour at a collective level. We report a study that is part of project focusing on the impact of social science knowledge on indirect action, with the aim of investigating students' understanding of causes to climate change (e.g., consumption), conceptions of effectiveness of policies – tax, subsidies and regulations and bans – and if this may impact on indirect action;

support for the aforementioned policies. Preliminary results show students who find policies effective, support policies, but support bans to a lesser degree than tax, subsidies and regulations. This is interesting as bans is an effective way of changing markets; reducing production of climate impacting goods and increasing climate friendly goods and services. We also find that students believing that the cause to climate change is lack of information do not support policies. Further research investigating if beliefs in policy being effective/functioning are due to education or other sources of information at a national/international level is a next step. Teachers interested in designing climate education with a focus on solutions at the societal level and policies need to pay attention to students' conceptions of anthropogenic causes as it may impact how relevant they find such a focus, and attention to students' conceptions of policy as they may differ in relation to product/service.

A quality climate education in Victorian schools? A cross-case comparison of pre-university subjects
Presenting Author: Karen Marangio, Monash University, Australia; **Co-Author:**Alan Reid, Monash University, Australia

Our paper analyses the changing affordances for climate learning in select curriculum for the Victorian Certificate of Education (VCE). Current education policy has created two main clusters for learning about climate within STEM and HASS VCE subjects. We argue these offer both core and peripheral areas for quality climate teaching and learning—i.e. that might engender hope and action—for 16-19 year olds, even as they present diverse opportunities for advancing learning and competence development in cognitive, socio-emotional and behavioural domains. The STEM cluster includes: Environmental Science, Biology, Chemistry, Physics, Psychology; and HASS: Geography, History, Australian and Global Politics, and Outdoor and Environmental Studies. Students will not take all of these VCEs (neither are any compulsory), while VCE subject teachers do not know what is expected or experienced within other subject designs beyond their field of expertise. Extending Dawson et al (2022)'s recent international comparative study of middle years climate-related curriculum, we examine the breadth, depth and quality of learning affordances in the current and next generation versions of VCEs to present an analysis of patterns of possible learning within and across subjects. Findings suggest continued fragmentation within some study designs, innovation and depth in others, and significant differences in emphasis and approach across each cluster. Our findings add to ongoing questions as to whether pre-university courses provide sufficient scaffolds and affordances for learners to develop their understandings, skills and values within a 'quality climate education'. We also discuss prospects for addressing them to better equip learners in challenging times.

Session S 5

26 August 2023 12:00 - 13:30
UOM_A02
Symposium
Higher Education

Exploring the Why?, What?, and How? of Student Learning in Challenge-Based Learning

Keywords: Competencies, Higher Education, Learning Approaches, Mixed-method Research, Motivation, Problem-based Learning, Qualitative Methods, Self-regulated Learning and Behaviour, Sustainable Development, Teaching Approaches
Interest group: SIG 04 - Higher Education
Chairperson: Karolina Doulougeri, Eindhoven School of Education, Netherlands
Organiser: Kerstin Helker, Eindhoven University of Technology, Netherlands
Organiser: Karolina Doulougeri, Eindhoven School of Education, Netherlands
Discussant: Kirsti Lonka, University of Helsinki, Finland

Challenge-based Learning (CBL) responds to calls for a more modern, student-centered education, that prepares them for the increasing uncertainty in their future. Compared to traditional pedagogy, CBL intends to bridge the real world and students' learning by exposing them to complex real-life challenges that require the acquisition and application of disciplinary and also transversal competencies. These unique characteristics of CBL require rethinking student learning processes and outcomes. Nevertheless, research on student learning in CBL is scarce. The researchers in this symposium will share insights on how characteristics of CBL influence student learning process and outcomes. Furthermore, this symposium provides a platform for advancing our theoretical understanding and practical insights for implementing and researching CBL.Our symposium consists of one conceptual and three empirical contributions. Firstly, it will discuss conceptual approaches and methodological insights about how to study and analyze students' learning in CBL. Secondly, it will present empirical findings from a mixed-methods study focusing on students' motivation to participate in CBL. Thirdly, it will present insights from a qualitative study focusing on students' regulation of learning in CBL, including regulation of cognitive, metacognitive, affective, and social aspects. Finally, it will discuss the empirical findings of a mixed-method study evaluating students' experiences with participation in CBL and students' reported learning gains. Taken together, this symposium will contribute to the scientific understanding of antecedents, processes, and implications of students' learning in CBL. Furthermore, it will provide suggestions for future research and the successful implementation of CBL that promotes students' active learning.

Creating the foundation for studying student learning in CBL – A heuristic framework
Presenting Author: Jan Vermunt, Eindhoven University of Technology, Netherlands; **Co-Author:**Kerstin Helker, Eindhoven University of Technology, Netherlands; **Co-Author:**Jasmina Lazendic-Galloway, TU/e innovation Space, Eindhoven University of Technology, Netherlands; **Co-Author:**Isabelle Reymen, Eindhoven University of Technology, Netherlands; **Co-Author:**Miguel Bruns, Eindhoven University of Technology, Netherlands

Challenge-Based Learning (CBL) has become increasingly popular in higher education as it responds to calls for learning environments that allow for students to take the lead in their own learning and acquire and apply disciplinary and transdisciplinary knowledge and skills. Prior research on CBL has mostly focused on identifying commonly agreed characteristics of the educational concept and capture the variety of its implementations. Nevertheless, work on how CBL influences student learning is scarce.
This work presents a first attempt to integrate prior research on student learning into the emerging field of CBL by developing a framework of student learning in CBL. This framework suggests an interplay between students' personal factors, learning patterns and learning gains at the core, being embedded in several levels of context, each with specific formal, social, and physical content that affect student learning.
In a second step, the proposed framework was tested with interview data collected from CBL teachers in order to explore its exhaustiveness and usefulness to describe learning processes in CBL. Results showed that teachers addressed all parts of the framework when reporting their deliberations for CBL implementation and course design. Results also suggested that the framework will be useful to systematically relate the various aspects of the CBL process and context in future research on student learning in CBL as well as education innovation.

Exploring participation motivation in Challenge-based learning using a mixed methods approach
Presenting Author: Selina Michel, Technical University Munich, Germany; **Co-Author:**Manuel Förster, Technical University Munich, Germany

Studying situative incentives, personal dispositions and expectations is key to understand students' motivation in Challenge-based learning (CBL). This study uses a mixed methods approach for describing motivation to participate in CBL-courses according to the extended cognitive model of motivation from Heckhausen and Heckhausen (2018). The results from surveying participants in the beginning of a CBL-course (N = 43) with different response formats (e.g. open questions, standardized items, raking item) (study 1) and qualitative interviews with the target group (N = 9) (study 2) provide an overview of situative incentives (e.g. interdisciplinary and escape from daily routine and traditional courses), personal dispositions (e.g. interest in learning about sustainability) and expectations on desired consequences (e.g. learning gains and competence development in the area of project management and generating societal impact) relevant for students' motivation in CBL. Also, efficacy expectations seem to be relevant for motivation in CBL. The findings presented has implications for future studies with regard to motivation in CBL and a design of CBL-courses that promotes motivation and active learning processes. University faculty should take into account which situative incentives, personal dispositions and desired consequences can influence motivation in CBL. For future research, this study offers implications regarding the selection of instruments to study motivation in CBL and which determinants of motivation should be studied in more detail.

Understanding students' regulation of learning in Challenge-based courses
Presenting Author: Karolina Doulougeri, Eindhoven School of Education, Netherlands; **Co-Author:**Gunter Bombaerts, Eindhoven University of Technology, Netherlands; **Co-Author:**Michael Bots, Eindhoven University of Technology, Netherlands; **Co-Author:**Jan Vermunt, Eindhoven University of Technology, Netherlands

Self-regulated learning (SRL) is one of the key pedagogical principles of Challenge-based Learning (CBL). Students in CBL have the primary responsibility for planning, implementing, and evaluating their effort and progress. Challenge-based learning (CBL) exposes students to the complexities of open-ended and real-life challenges and encourages them to be in the lead of their learning. Still, the way students regulate their learning remains largely unknown, and existing literature suggests that students struggle to regulate their learning within CBL. This study explores how first-year engineering students regulate their learning during an 11-week CBL course in ethics and data analytics. Thirty-nine students completed a weekly diary for the duration of the course. In total, we analyzed 380 student reflections. A thematic analysis was conducted and we identified four themes related to students' experience with open-ended and real-life challenges, including challenge definition, learning and working process, solution development, and dissemination. Within each theme, we identified reported cognitive, metacognitive, affective, and social activities that students engage in to regulate their learning. The frequency of mentioned regulation activities varied across the four identified themes. Results suggest that students constantly regulate their learning at multiple levels when facing an open-ended challenge. In addition, a strong social component in student regulation in CBL was identified. Building on the insights of this research, we make recommendations for further research and educational practice.

Students' experiences with challenge based learning in interdisciplinary and international courses
Presenting Author: Simon David, Ghent University, Belgium; **Co-Author:**Tijs Rotsaert, Ghent University, Belgium; **Co-Author:**Tammy Schellens, Ghent University, Belgium

Little is known about students' experience in challenge based learning (CBL) approaches, especially in courses outside the STEM-domain. This study addresses this gap by studying students' perspective in two interdisciplinary and international courses organized within a European university network. A mixed-methods design was utilized combining a thematic analysis of focus groups and a pre-post questionnaire. The preliminary results suggest that students found CBL to be an enriching experience that also strengthened their general competencies such as critical thinking, problem solving and interpersonal skills. However, the knowledge gains reported by the students were limited. Recommendations for future iterations of challenge based courses with international students and non-STEM topics are made.

Session S 6

26 August 2023 12:00 - 13:30
AUTH_DC2
Symposium
Motivational, Social and Affective Processes

Towards a Process-Perspective on the Role of Emotion in Argumentation, Dialogue, and Reasoning

Keywords: Argumentation, Computer-supported Collaborative Learning, Dialogic Pedagogy, Emotion and Affect, Learning Analytics, Peer Interaction, Qualitative Methods, Self-regulated Learning and Behaviour, Social Interaction
Interest group: SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Armin Weinberger, Saarland University, Germany
Organiser: Armin Weinberger, Saarland University, Germany
Organiser: Claire Polo, France
Organiser: Kristine Lund, France
Organiser: Sara Ahola, University of Oulu, Finland
Organiser: Hanna Jarvenoja, University of Oulu, Finland
Organiser: Tiina Susanna Törmänen, University of Oulu, Finland
Organiser: Jonna Malmberg, University of Oulu, Finland
Organiser: Lena Aoyama Lawrence, Saarland University, Germany
Organiser: Nikki Lobczowski, McGill University, Canada
Organiser: Timothy Nokes, University of Pittsburgh, United States
Organiser: DIane Litman, University of Pittsburgh, United States
Organiser: Yuya Asano, University of Pittsburgh, United States
Organiser: Chloe Dahan, University of Pittsburgh, United States
Organiser: Teresa Davison, University of Pittsburgh, United States
Organiser: Adriana Kovashka, University of Pittsburgh, United States
Organiser: Erin Walker, University of Pittsburgh, United States
Discussant: Freydis Vogel, Universität Hamburg, Germany

Recent research pointed out the importance of building and integrating theories of emotions for learning (Moreno & Woodruff, 2022; Pekrun & Marsh, 2022) and regarded emotion as an integral part of presumably rational processes of argumentation and reasoning together (Aoyama Lawrence & Weinberger, 2022; Polo, Lund, Plantin & Niccolai, 2016). In this symposium, we aim to discuss different perspectives on how to conceptualize emotional processes' role in learning, how to measure emotions, and how to regulate and facilitate emotions productively in dialogic and collaborative learning scenarios. Regarding *conceptualization*, multi-faceted emotions would co-develop and mutually reinforce among partners in collaborative learning scenarios, which would either indicate motivational and cognitive breakdowns of group processes, e.g., misunderstandings or open conflicts (Polo & Lund, 2021; Baker, Andriessen & Lund, 2009), or be indicative of shared moments of positive excitement of sharing understanding and joint breakthroughs towards task solution (Aoyama Lawrence & Weinberger, 2022). Regarding *measurement*, we present ways of capturing emotions in collaborative learning through analysis of videos of learners' gestures and mimics (e.g., Lobczowski, 2022; Schmitt & Weinberger, 2019), analysis of discourse (e.g., Rogat & Linnenbrink-Garcia, 2011), retrospective surveys (e.g., Järvenoja, Volet, & Järvelä, 2013), and physiological measures such as electrodermal activity (e.g., Törmänen, Järvenoja, Saqr, Malmberg, & Järvelä, 2022; Aoyama Lawrence & Weinberger, 2022). Regarding *regulation and facilitation*, we investigate influences of prior assessments and scaffolds for collaborative learning, e.g., for joint attention and engagement, as well as forms of regulating emotions for fostering collective reasoning on disruptive ideas in dialogic pedagogy.

Exploring Social Contagion in a CSCL Environment with a Social Robot
Presenting Author: Nikki Lobczowski, McGill University, Canada; **Co-Author:**Yuya Asano, University of Pittsburgh, United States; **Co-Author:**Chloe Dahan, University of Pittsburgh, United States; **Co-Author:**Teresa Davison, University of Pittsburgh, United States; **Co-Author:**Timothy Nokes, University of Pittsburgh, United States; **Co-Author:**DIane Litman, University of Pittsburgh, United States; **Co-Author:**Adriana Kovashka, University of Pittsburgh, United States; **Co-Author:**Erin Walker, University of Pittsburgh, United States

In collaborative learning environments, students are often influenced by their peers, which can shape their learning, behaviors, and emotions. Nevertheless, not much is known about how and why social contagion occurs in learning. Thus, for this study, we explored how social contagion emerged in a human-human-robot learning environment. In this representative case study, we chose four dyads of undergraduate students who rated their attitudes towards collaboration as high and similar, high and dissimilar, low and similar, and low and dissimilar before engaging in teaching a social robot how to solve ratio problems. Then, we coded for socioemotional analysis and sentiments using a text-mining technique to support our qualitative analysis of patterns in the students' interactions and speech. Our preliminary findings highlight how students can engage in both positive socioemotional interactions and negative speech, which can then negatively shift the

tone of the conversation. Moreover, we found how attitudes about collaboration, as well as other factors such as interest and efficacy, may contribute to social contagion. Finally, we found that both formal and informal norms constructed at the beginning of an activity often set the stage for the duration of the task. These findings have research implications for continued exploration and testing in this area and practical considerations for group formation and interventions for maladaptive interactions.

Does physiological synchrony vary when we guide collaborative learners where to look at?
Presenting Author: Armin Weinberger, Saarland University, Germany; **Co-Author:**Lena Aoyama Lawrence, Saarland University, Germany

Learners' emotion plays a central role, especially in co-present, collaborative forms of learning. Previous studies show that learners' engagement, motivation, and task performance are strongly affected by their emotions in the learning process (Pekrun, 2006). Besides traditional emotion evaluations, i.e., subjective ratings via questionnaire items, physiological indicators such as electrodermal activity (EDA), heart rate (HR), and blood volume pressure (BVP) have been introduced as indicators of leaners' emotions (Pijeira-Díaz et al., 2016). Dyadic physiological coupling has been applied for investigating emotional synchrony in collaborative learning. In this proposal, we first present the analysis of joint emotional shifts of 28 dyads with non-linear methods, i.e., recurrence quantification analysis (CRQA). We then compare the results of CRQA with correlations and discuss the advantage of applying CRQA. From the result, no difference has been found among the three conditions, given different gaze instructions. CRQA and correlation showed similar results on indicating dyads synchrony.

How do students' emotional expressions and regulation dialogue intertwine in collaborative learning?
Presenting Author: Sara Ahola, University of Oulu, Finland; **Co-Author:**Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:**Tiina Susanna Törmänen, University of Oulu, Finland; **Co-Author:**Jonna Malmberg, University of Oulu, Finland

In collaborative learning, socially shared regulation of learning (SSRL) is embedded in group interaction. Gradually, it is built up in a dialogue between group members aiming to ensure progress towards shared goals. While research has shown that SSRL within groups vary, we have relatively little understanding of what defines the quality of this variation. We claim that the nature of regulation dialogue is defined by group members' contributions to the interaction and affected by their socio-emotional interactions, and that this relationship is yet to be empirically discovered. The complex situated relations between the group members' constantly reshaped emotional experiences and the qualitatively varying nature of regulation dialogue call for methodological approaches that can capture both emotional and interactive components in the situation. To this end, the current study committed to a process-oriented approach that integrates students' situational emotional expressions with in-depth investigation of the group members' contributions to the regulation dialogue. The participants were 7th graders (n=54, 18 groups) videotaped during their collaborative work across four science lessons to capture the contributions to regulation and the valence of simultaneous emotional expressions. The observable emotional expressions were further complemented with group members' physiological emotional activation data. The analysis combined the different data channels to investigate the contributions to regulation in relation to the groups' emotional valence and activation in the situation. The results shed light into the complexity of collaborative group process as it is characterized by the intertwining of both the regulation dialogue and the socio-emotional interactions of the group.

The emotional capture of kairos during philosophical group discussions with children
Presenting Author: Claire Polo, ECP Laboratory, France; **Co-Author:**Kristine Lund, CNRS & Ecole Normale Supérieure de Lyon, France

An essential gesture of animating C*ommunities of Philosophical Inquiry* (CPI) consists in identifying and grasping within children's talk, an opportune word or turn of phrase, the *kairos*, and bouncing off it to advance collective reasoning. Such*kairos*'s grasping may occur directly between peers, one reacting to other's disruptive idea, but it often requires more or less extensive teacher guidance. Based on the analysis of expert teacher practices, we propose a typology of the emotional grasp of *kairos* that reflects a double bind for both teachers and students. This double bind illustrates the tension between two communicative contracts, one for philosophy discussions and the other for classroom practices. On the one hand, playing the game of philosophical exploration implies that children step out of their role as learners in the typical classroom. On the other hand, the teacher must find a path between facilitating the group investigation of the philosophical problem and scaffolding the pursuit of understanding the conceptual notions under discussion. Beyond the effect of surprise, we describe how teachers model regulation that makes it possible for children to welcome and share their emotions and to make them evolve into wonder, astonishment or doubt. Such trajectories are decisive for the future of the new idea embodied as a *kairos*. But other, also frequent, teacher reactions show missed facilitation opportunities. Future teacher training can thus be based on both the identification of pedagogical and philosophical opportunities, and the effects of diverging facilitating practices regarding the emotional grasping of *kairos*.

Session S 7

26 August 2023 12:00 - 13:30
AUTH_T102
Single Paper
Higher Education

PhD Holders' Careers In and Beyond Academia

Keywords: Doctoral Education, Higher Education, Quantitative Methods, Researcher Education, Social Interaction, Social Sciences and Humanities, Well-being
Interest group: SIG 24 - Researcher Education and Careers
Chairperson: Saskia Schreiter, University of Education Heidelberg, Germany

PhD graduates' preparedness for careers beyond academia: The role of support communities
Keywords: Doctoral Education, Higher Education, Researcher Education, Social Interaction
Presenting Author: Nata Kereselidze, University of Geneva and HES-SO (University of Applied Sciences and Arts Western Switzerland), Switzerland; **Co-Author:**Isabelle Skakni, University of Applied Sciences and Arts Western Switzerland, Switzerland

This paper addresses PhD holders' perception of their doctoral training's relevance for non-academic careers and the institutional support they received to prepare for such careers. Drawing on the concept of support communities, we analysed the responses to an online questionnaire and interview accounts of 36 PhD holders working in the private, public/para-public and so-called "third space" sectors in Switzerland. Our findings suggest that doctoral training in its current form does not always prepare PhD holders to seek and hold positions beyond academia, especially those with a linear path. Regardless of the discipline, most participants reported having received little to no institutional support and encouragement to prepare for anything outside of an academic career. However, for those who did report some degree of support, the main source remains the *doctoral community*, in particular discussions and information sharing among peers and, to a lesser extent, the *in-between community*, especially through discussions with PhD holders who have made the transition from academia to another sectors and career development workshops offered by non-profit organisations. These findings contribute to the current global debate about doctoral education's value in preparing PhD graduates for diverse career paths.

Variation in humanities and social sciences PhD holders' careers beyond academia – the Finnish case
Keywords: Doctoral Education, Higher Education, Researcher Education, Social Sciences and Humanities
Presenting Author: Laura Sundström, University of Helsinki, Finland; **Co-Author:**Kirsi Pyhältö, University of Helsinki, Finland; **Co-Author:**Lotta Tikkanen, University of Helsinki, Finland; **Co-Author:**Henrika Anttila, University of Helsinki, Finland

Over the past decade PhD careers have diversified and careers both within and outside the academia have transformed (Brechelmacher, et al., 2014), and this has involved the academic career becoming less prominent career for PhD graduates (Enders, 2004). For example, in Finland only 27% of STEM PhDs report committing to academic careers, while 66% of humanities and social sciences (HSS) PhDs stayed in academia. The private sector is the largest employer of STEM PhDs beyond academia, while HSS PhDs are suggested to work primarily in public and para-public sectors. Yet research on HSS PhD careers has been limited, leaving us ill-prepared to support HSS PhD candidates who strive to pursue careers outside academia. This study focuses on mapping Finnish HSS PhD

degree holders' employment profiles, job profiles and the sectors they work in by using national PhD career monitoring survey (Aarresaari, 2019). Altogether 291 HSS PhD degree holders answered the survey. Preliminary results suggest that HSS PhDs work in several different sectors, including private, para-public and public organizations and companies. In the next phase of the study, employment and job profiles will be analyzed. The results of the study will provide novel research-based understanding on HSS careers outside academia that can be used in developing doctoral education. Also new directions for research will be provided.

Foreign early career academics' well-being profiles at workplaces: A person-oriented approach
Keywords: Higher Education, Quantitative Methods, Researcher Education, Well-being
Presenting Author: Yusuke Sakurai, Hiroshima University, Japan

The well-being of foreign early career academics (FECAs) has been the subject of research attention in relation to present demanding academic milieux in general and to those unfamiliar workplace settings in particular. A traditional variable-oriented approach that focuses on mean scores can easily gloss over the diverse nature of the group under study. Our study, conducted in Japan, took a person-oriented approach and identified FECAs' distinct well-being profiles and the associations of their personal attributes with the profiles. Most (64%) were classified as having the highest stress scores and moderate scores for a sense of belonging, control of workload and career development engagement. The second-largest profile (29%) included FECAs characterised by the lowest stress score and a strong sense of belonging, control of workload and career development engagement. Those in the smallest profile (8%), who had moderate levels of workload control and stress, lacked a sufficient sense of belonging and career development engagement. Among FECAs' personal attributes, contract type was significantly associated with their distribution across the three well-being profiles, whereas no attributes of FECAs' unique nature significantly pertained to their distribution. Our results suggested that support for well-being may be important regardless of background. Our investigation, using multifaceted well-being subscales over a composite scale, offers analytical, strategic support for academics in globalised higher education.

Session S 8

26 August 2023 12:00 - 13:30
UOM_A10
Single Paper
Assessment and Evaluation, Higher Education, Teaching and Teacher Education

University Students' Dropout: Reasons and Prevention

Keywords: Anxiety and Stress, At-risk Students, Educational Attainment, Higher Education, Mathematics/Numeracy, Motivation, Pre-service Teachers, Quantitative Methods, Self-efficacy, Self-regulated Learning and Behaviour, Well-being
Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education, SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education
Chairperson: Helen Jossberger, University of Regensburg, Germany

Educational and occupational pathways of persons who withdraw from teacher education programs
Keywords: At-risk Students, Educational Attainment, Higher Education, Pre-service Teachers
Presenting Author: Sebastian Franz, Leibniz Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:**Steffen Schindler, University of Bamberg, Germany

A lack of qualified teachers is a common problem in many European countries. Investigating reasons for non-completion in teacher education programs and examining, which alternatives seem to attract former teacher education students, is hence important to understand the origin of teacher shortage. Based on data from the National Educational Panel Study (NEPS), we examined career pathways of about 350 persons who not completed teacher education with a university degree that qualifies for teaching. We assume that former teacher education students chose a career that exceed the benefit-cost calculus of becoming a teacher and offer a higher chance of success. Preliminary results reveal that 60% of respondents were still studying at a university one month after leaving their teacher training program and, hence, remain in higher education. Sequence analyses are planned to identify career patterns. Findings are discussed in terms of their implications.

Reciprocal Relations Between Facets of Study Satisfaction, Procrastination, and Dropout Intentions
Keywords: Higher Education, Quantitative Methods, Self-regulated Learning and Behaviour, Well-being
Presenting Author: Anne Scheunemann, Ruhr-University Bochum, Germany; **Co-Author:**Theresa Schnettler, Mannheim University, Germany; **Co-Author:**Lisa Bäulke, University of Tübingen, Germany; **Co-Author:**Daniel Thies, Ruhr-University Bochum, Germany; **Co-Author:**Markus Dresel, University of Augsburg, Germany; **Co-Author:**Stefan Fries, University of Bielefeld, Germany; **Co-Author:**Detlev Leutner, University of Duisburg-Essen, Germany; **Co-Author:**Joachim Wirth, Ruhr-University Bochum, Germany; **Co-Author:**Carola Grunschel, University of Münster, Germany

Student dropout is a multi-causal and dynamic process (Heublein, 2014). Although reciprocal relations of important predictors for actual student dropout are conceivable, our knowledge is limited. Moreover, the scarce empirical findings, for example on study satisfaction, procrastination, and dropout intentions, are inconsistent (e.g., Fleischer et al., 2019; Scheunemann et al., 2021). Some of the inconsistencies concerning the results on study satisfaction may be explained by not considering the facets of study satisfaction (e.g., satisfaction with study content (S-content), coping with study related stress (S-coping); Schiefele & Jacob-Ebbinghaus, 2006). The aim of the current study was to examine the reciprocal relations between two facets of study satisfaction (i.e., S-content and S-coping), procrastination, and dropout intentions more differentiated. In the three-wave panel study over the course of one semester $N = 1435$ undergraduate students participated. We analyzed data with cross-lagged panel models (Geiser, 2013). Model 1 (S-content) indicated that S-content mediated the relation between procrastination and dropout intentions and revealed negative reciprocal relations between dropout intentions and S-content. In model 2 (S-coping), S-coping and procrastination were not significantly related longitudinally. However, it revealed negative reciprocal relations between dropout intentions and S-coping. Our study advances the understanding how different facets of study satisfaction longitudinally relate to procrastination and dropout intentions. It underlines the importance to differentiate between the facets of study satisfaction (Wach et al., 2016). Students with dropout intentions could benefit from training to increase interest in study content or to deal with perceived study stress (e.g., Rosenzweig et al., 2020).

Study satisfaction and drop-out intention of mathematics pre-service teachers from EVT perspective
Keywords: Mathematics/Numeracy, Motivation, Pre-service Teachers, Self-efficacy
Presenting Author: Robin Göller, Leuphana University Lueneburg, Germany; **Co-Author:**Lara Gildehaus, Paderborn University, Germany

Pre-service mathematics teachers are currently in high demand in Germany, but face high study drop-out and low study satisfaction. Taking into account the subject-specific characteristics of mathematics teacher training, we investigate study satisfaction and drop-out intentions of mathematics preservice teachers from an expectancy-value theory perspective. More specifically, we examined what effects mathematics-specific expectancies, values, and perceived costs have on mathematics pre-service teachers' study satisfaction and drop-out intention, by analysing data of 257 students with a structural equation model. Results show significant effects on study satisfaction for self-efficacy, intrinsic value, mathematics content-related attainment value, mathematics teaching-related attainment value, and effort cost. Significant effects on students' drop-out intention were found for mathematics teaching-related attainment value and effort cost. Utility value has no significant effect on either study satisfaction or drop-out intention. These results suggest that in order to counteract dissatisfaction and drop-out, interventions should rather focus on self-efficacy, intrinsic and attainment values and on keeping costs within limits, than focusing on utility value.

The influence of test anxiety on indicators of dropout and study delay
Keywords: Anxiety and Stress, At-risk Students, Higher Education, Quantitative Methods
Presenting Author: Nikolai Zinke, Deutsches Institut für Erwachsenenbildung Leibniz-Zentrum für Lebenslanges Lernen e.V., Germany; **Co-Author:**Martin Merkt, Deutsches Institut für Erwachsenenbildung, Germany; **Co-Author:**Hannes Schröter, German Institute for Adult Education - Leibniz Centre for Lifelong

Learning, Germany; **Co-Author:**Natalia Reich-Stiebert, FernUniversität in Hagen, Germany; **Co-Author:**Stefan Stürmer, FernUniversität in Hagen, Germany; **Co-Author:**Sina Lenski, Deutsches Institut für Erwachsenenbildung, Germany

To support students in their university careers, education policy makers and universities need insights into the role of different variables that influence dropout risk, extended duration of study, and academic failure. In particular, early indicators of academic performance such as exam performance, exam postponement, exam failure, and exam non-participation after registration have proved to be good predictors of dropout. The present study examined how different facets of test anxiety affect these early warnings signs of dropout. Therefore, survey data and administrative data from $N = 542$ students enrolled in their first semester at a distance university were examined using multiple regression analyses. Results showed a significant negative association between the cognitive and the motivational facets of test anxiety and the behavioral intention to participate in the first exam as well as exam performance. A direct association of test anxiety with the postponement of the first exam was not found. Overall, the present study identified test anxiety as possible factor that could influence dropout and study delay. This finding could help to identify students at risk and to establish suitable interventions.

Session S 9

26 August 2023 12:00 - 13:30
UOM_R05
Single Paper
Cognitive Science, Teaching and Teacher Education

Mathematics and Numeracy in Early Childhood Education

Keywords: Cognitive Development, Cognitive Skills and Processes, Developmental Processes, Early Childhood Education, Mathematics/Numeracy, Primary Education, Teaching/Instructional Strategies
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 14 - Learning and Professional Development
Chairperson: Elisavet Chrysochoou, Aristotle University of Thessaloniki, Greece

Visuospatial working memory explains associations between early math abilities and ANS
Keywords: Cognitive Development, Cognitive Skills and Processes, Early Childhood Education, Mathematics/Numeracy
Presenting Author: David Munez, National Institute of Education / Nanyang Technological University, Singapore; **Co-Author:**Josetxu Orrantia, University of Salamanca, Spain; **Co-Author:**Rosario Sánchez, University of Salamanca, Spain; **Co-Author:**Laura Matilla, Univeresity of Salamanca, Spain; **Co-Author:**Rebecca Bull, Macquarie University, Australia

It has been suggested that associations between non-symbolic quantitative skills and symbolic quantitative skills are stronger at early stages in development. Nonetheless, few studies have considered preschool and kindergarten children to investigate such associations. In this study (n=340, M_{age}=70 months, SD_{age}=4; 46% females), we explored kindergarteners' acuity of the approximate number system (ANS). Specifically, we investigated associations between ANS acuity and math achievement and whether such associations simply reflected shared variance with domain-general skills (indexed as spatial, verbal, and non-verbal aspects). Results from a path analysis revealed that associations between math achievement and ANS acuity in kindergarteners were fully intermediated by domain-general variables that included spatial, verbal, and non-verbal aspects. Results from a generalized mixed model to investigate individual differences in a non-symbolic discrimination task further supported that finding. Only the child' spatial WM explained the probability of triggering a correct response. Indeed, the size of the ratio effect (only) varied as a function of that capacity. Findings call attention to theoretical and applied approaches that have underscored the role of ANS on children's development of symbolic quantitative knowledge.

Developmental relations between manual dexterity and mathematical cognition
Keywords: Cognitive Development, Cognitive Skills and Processes, Developmental Processes, Mathematics/Numeracy
Presenting Author: Venera Gashaj, Loughborough University, United Kingdom; **Co-Author:**Dragan Trninić, Swiss Federal Institute of Technology ETH Zurich, Switzerland

Embodied cognition frameworks argue that cognition is embodied in some fundamental way, although the nature and development of this relationship remain poorly understood. We present data from ongoing research into the development of mathematical reasoning in younger children—examined through an analysis of fine motor skills development. Results indicate that fine motor skills positively relate to mathematics development, and that this relation decreases with age, as expected. A novel contribution of the study is that dominant and non-dominant handedness further differentiates the relation between fine motor skills and mathematical ability. This finding on handedness opens a novel avenue for educational interventions.

Supporting or Restricting Mathematical Communication and Reasoning in Teaching 6-year olds
Keywords: Early Childhood Education, Mathematics/Numeracy, Primary Education, Teaching/Instructional Strategies
Presenting Author: Jessica Elofsson, University of Gothenburg, Sweden; **Presenting Author:**Anna-Lena Ekdahl, Jönköping University, Sweden

Communication and reasoning in mathematics is described as important for student learning. Hence, teachers have a central role to invite students to engage in reasoning and collective problem solving. One common way to promote this is for the teacher to ask questions. However, there is limited knowledge of how teachers make use of the input provided by students on the asked questions in their mathematics teaching to support further learning and mathematical inquiry. In the present study, we investigated qualitative differences in how preschool class teachers responded to and incorporated 6-yearold students' input in teaching about numbers and arithmetic. The data gathered for analysis consisted of fieldnotes collected through observations of 145 mathematics teaching episodes in 95 classes. To make it possible to map the qualitative different ways teachers responded to and incorporated students' input in their teaching, the Mediating Primary Mathematics framework was used as an analytical tool. The results show that teachers responded to and incorporated student input in different ways in their teaching. In almost 2/3 of the teaching episodes, teachers stopped at only briefly confirming the input given as right or wrong, or just gave generally encouraging responses to the student. In just under 1/3 of the teaching episodes, teachers took advantage of and incorporated student input in their teaching to advance and verify their mathematical reasoning. This highlights that teachers may develop their ways of responding to and elaborating on students' input in teaching, which could improve students' opportunities for learning mathematics.

Session S 10

26 August 2023 12:00 - 13:30
UOM_A13
Single Paper
Cognitive Science, Learning and Instructional Technology, Learning and Special Education

Reading: Typical and Atypical Development

Keywords: Achievement, At-risk Students, Cognitive Development, Computer-assisted Learning, E-learning/ Online Learning, Early Childhood Education, L1/Standard Language Acquisition, Reading, Self-concept, Writing/Literacy
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 12 - Writing, SIG 15 - Special Educational Needs
Chairperson: Alicia Ramos, KU LEUVEN, Belgium

Are Late-Emerging Reading Problems Truly Late- or Gradually Emerging?
Keywords: At-risk Students, Early Childhood Education, Reading, Self-concept
Presenting Author: Julie Arntzen, The Norwegian Reading Centre (University of Stavanger), Norway; **Co-Author:**Oddny Judith Solheim, The Norwegian Reading Centre, Norway; **Co-Author:**Njål Foldnes, The Norwegian Reading Centre, Norway

Children who struggle with language comprehension but have adequate decoding skills often go under the radar in the first years of reading instruction and are over-represented among so called late-emerging poor readers. Consequently, little is known about the early development of reading skills and reading self-beliefs for this student group. In the present study we identified risk groups based on decoding and language comprehension scores in a large sample of first graders (N = 1142). We then compared latent growth curve models for reading comprehension and reader self-concept between children starting out with low scores in language comprehension (risk-LC, n = 609) and students starting out with low scores on decoding (risk-DC, n = 533). Students in the risk-LC group started out with higher reading comprehension scores, but progressed less than students in the risk-DC group. By Grade 3 there was no difference between the two groups in reading comprehension score. For reader self-concept, students in the risk-LC group started out higher than students in the risk-DC group, but experienced a greater decrease over time. These results suggest that students with low language comprehension at an early stage are at-risk for a negative development in both reading comprehension and reader self-beliefs, and that early identification and intervention might be meaningful to prevent this from happening.

Computer-based development of reading skills to bridge learning gap of disadvantaged students
Keywords: Achievement, Computer-assisted Learning, E-learning/ Online Learning, Reading
Presenting Author: Renáta Kiss, University of Szeged Institute of Education, MTA-SZTE Digital Learning Technologies Research Group, MTA-SZTE Research Group on the Development of Competencies, Hungary; **Co-Author:**Katalin Szili, Hungarian University of Agriculture and Life Sciences, Institute of Education, Hungary; **Co-Author:**Dora Mokri, Szeged Center for Research on Learning and Instruction!, Hungary; **Co-Author:**Gyöngyvér Molnár, University of Szeged, MTA-SZTE Digital Learning Technologies Research Group, Hungary

An adequate level of reading comprehension is a prerequisite for successful learning. Numerous studies have shown that without a solid foundation, there can be severe difficulties in learning to read as well as in case of reading comprehension. That drawback in the first years of schooling can determine attitudes to learning. The study presents the effect size of an online game-based intervention program implemented in the eDia online system. The primary goal of the study is to develop fluency in reading and reading comprehension in Grades 3–4 which can be integrated into both classroom-based lessons and extracurricular activities outside of class. The quasi-experimental research involved 276 3-4 Graders, 68 were disadvantaged students. Propensity score matching was used to increase the validity of the results. The effect size of the training program proved to be good on sample level (d=.51). It was high among disadvantaged students (d=.72) and extraordinary high in the low-skilled disadvantaged group of students (d=2.04). The study provided evidence that a well-designed online training program is suitable for developing reading comprehension and overcoming disadvantages, even without the presence of the teacher.

Effects of handwriting and typing on learning new words in typically developing and dyslexic readers
Keywords: Cognitive Development, L1/Standard Language Acquisition, Reading, Writing/Literacy
Presenting Author: Tania Cerni, University of Padova, Italy

Today, during literacy development, handwriting and typing often coexist. As they allow different writing movements, they probably contribute differently to forming lexical representations with integrated motor information. The present study was designed to understand the effects of the two writing modalities in supporting the memorization of orthographic and semantic information of new words. A group of 18 Italian middle school students with a diagnosis of developmental dyslexia (DD) and a group of 18 age-matched typically developing readers (TD) learned a set of pseudowords paired with images by typing or handwriting. Then, they were asked to spell under dictation the same words with both writing modalities and to pair the images with the correct corresponding words. Accuracy in all the tasks, but also chronometric measures during writing were collected. Results suggested that the writing modality during learning was equally determinant in reproducing the correct spelling regardless of the group. On the contrary, handwriting training supported the memorization of the word referent more than typing for TD, but not for DD. Experiencing the motor aspects of writing could interfere with word memorization in dyslexic readers who have difficulties in constructing an integrated lexical representation.

Session S 11

26 August 2023 12:00 - 13:30
UOM_R09
Single Paper
Motivational, Social and Affective Processes

Self-determination Theory: Need Support, Motivation and Engagement

Keywords: Attitudes and Beliefs, Engagement, Motivation, Quantitative Methods, Secondary Education, Self-concept, Self-determination
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Michael Schneider, University of Trier, Germany

Need Satisfaction and Frustration Profiles: Stability over Time and Associations with Motivation
Keywords: Motivation, Quantitative Methods, Secondary Education, Self-determination
Presenting Author: Christa Krijgsman, Fontys Hogeschool/Kenniscentrum Youth Education for Society, Netherlands; **Co-Author:**Tim Mainhard, Leiden University, Netherlands; **Co-Author:**Lisette Hornstra, Utrecht University, Netherlands; **Co-Author:**Leen Haerens, Ghent University, Belgium; **Co-Author:**Jan van Tartwijk, Utrecht University, Netherlands; **Co-Author:**Lars Borghouts, Fontys University of Applied Sciences, Netherlands; **Co-Author:**István Tóth-Király, Concordia University, Canada

Satisfaction and frustration of students' need for autonomy, competence, and relatedness represent independent yet related dimensions, indicating that these dimensions can co-occur in different combinations. Few studies have examined the interplay between the different need dimensions, thereby leaving unanswered which combinations of these dimensions occur in practice and if high levels of satisfaction (or low frustration) in one or two dimensions can compensate for a lack of satisfaction (or high frustration) in another dimension. More insight into such combinations of needs – and their temporal stability – is needed as different combinations may yield different motivational gains. Therefore, using a person-centered approach, the current study identified subpopulations of physical education students characterized by combinations (i.e., profiles) of need satisfaction and frustration, and assessed the extent to which such profiles remained stable over two months. We also examined how these profiles associated with motivational outcomes. Students (*N*=490) completed measures twice. A four-profile solution appeared to be most optimal at both time points and demonstrated high levels of profile similarity across time: Average Fulfilled, Moderate Fulfilled, Highly Fulfilled and Highly Unfulfilled. These profiles differed across almost all outcomes. The Highly Fulfilled profile was associated most strongly with autonomous motivation. The Highly Unfulfilled profile was associated most strongly with amotivation. The specific needs dimensions in the Highly Fulfilled and Highly Unfulfilled profiles operated similarly: no single specific dimension defined the profiles. This might indicate that needs collectively vary or that students did not have a differentiated experience of autonomy, competence and relatedness satisfaction and frustration.

Does basic psychological need support lead to increased self-concept and int. motivation in PE?
Keywords: Motivation, Quantitative Methods, Self-concept, Self-determination
Presenting Author: Felix Kruse, University of Teacher Education St. Gallen, Switzerland; **Co-Author:**Sonja Büchel, University of Teacher Education St. Gallen, Switzerland; **Co-Author:**Christian Bruehwiler, University of Teacher Education St.Gallen, Switzerland

Physical education partly has different goals than the more cognitive subjects. Accordingly, an important basic idea concerns participation in the culture of movement and sport and, associated with this, an ongoing active lifestyle. Therefore, different goals that serve less to achieve the highest possible performance of the students are of special importance. In particular, intrinsic motivation as well as self-related cognitions could be identified as significant factors for children and adolescents dropping out of organized sports. In this paper, based on self-determination theory, the effects of teacher support of the three basic psychological needs on the development of intrinsic motivation and physical self-concept of specific sports over a period of about six weeks are examined. Unlike most other self-determination theory based studies for physical education, the focus is not exclusively on autonomy support, but also includes support for competence as well as relatedness, which has received little attention in physical education so far.

Latent student profiles based on agentic engagement and teacher autonomy support
Keywords: Attitudes and Beliefs, Engagement, Quantitative Methods, Secondary Education
Presenting Author: Luisa Molinari, University of Parma, Italy; **Co-Author:**Valentina Grazia, Università degli studi di Parma, Italy; **Co-Author:**Consuelo Mameli, University of Bologna, Italy

Research on student participation in school has provided evidence that student agentic engagement and teacher autonomy support are two crucial features of the interactional learning environment that may be considered as interdependent and complementary dimensions (Matos et al. 2018). In the present study we adopted a person-oriented approach to identify latent profiles of adolescents characterized by unique patterns of agentic engagement and perceived teacher autonomy support. Moreover, based on previous research results (Mameli et al. 2019; Molinari & Mameli 2018), we investigated whether perceived interpersonal justice could predict profile membership and compared different profiles on sense of responsibility. Participants were 545 Italian secondary school students (55% boys, 94% born in Italy, M_{age} = 14.24, SD_{age} = .53) who completed self-report questionnaires at the beginning, middle and end of the school year. Latent Profile Analysis indicated that five different adolescents' profiles existed: *disengaged* (24%), *average students* (34%) and *committed* (28%), with low, mean and high scores, respectively, in both teacher autonomy support and agentic engagement; *resistant* (5%), with low scores in teacher autonomy support and high scores in agentic engagement; *compliant* (9%), with high scores in teacher autonomy support and low scores in agentic engagement. Perceptions of interpersonal justice significantly predicted profile membership in the comparison of almost all profiles. Several significant differences among profiles in responsibility also emerged.

Self-Supportive Strategies to Regulate Autonomy and Motivation
Keywords: Attitudes and Beliefs, Motivation, Quantitative Methods, Self-determination
Presenting Author: Barbara Flunger, Utrecht University, Netherlands; **Co-Author:**Lau Lilleholt, Aarhus University, Denmark; **Co-Author:**Robert Böhm, Universität Wien, Austria; **Co-Author:**Ingo Zettler, University of Copenhagen, Denmark; **Co-Author:**Anouk Verdonschot, University Utrecht, Netherlands; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

People regularly encounter situations in which they have to engage in tasks they find boring or irrelevant, in which case their need to act in ways that are meaningful for oneself (i.e., their need for autonomy) is challenged. In the many situation in which no motivational support is available, individuals need to find ways to overcome this challenge by themselves. With a large sample (N = 1,779), we investigated whether people apply self-supportive strategies to boost their feelings of autonomy and motivation. The self-reported use of autonomy regulation strategies was strongly positively associated with intrinsic and internalized types of motivation, weakly positively correlated with negative introjection, and not associated with extrinsic motivation. Thus, our findings highlighted that the quality of motivation (extrinsic versus intrinsic motivation) may depend on the relative autonomy individuals achieve to create for themselves.

Session S 12

26 August 2023 12:00 - 13:30
AUTH_T202
Single Paper
Assessment and Evaluation, Motivational, Social and Affective Processes

Foreign and Second Language Acquisition

Keywords: Anxiety and Stress, Assessment Methods, At-risk Students, Bilingual Education, Developmental Processes, Early Childhood Education, Feedback, Foreign and Second Language Acquisition, In-service Teachers, Migrant / Refugee and Minority students, Primary Education, Well-being
Interest group: SIG 01 - Assessment and Evaluation, SIG 05 - Learning and Development in Early Childhood, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Jon Brodal, Norway

In-Service Primary Teachers' Feedback Perceptions and Essential Learning Moments: Feedback Agency?
Keywords: Feedback, Foreign and Second Language Acquisition, In-service Teachers, Primary Education
Presenting Author: Michel Cabot, Western Norway University of Applied Sciences, Norway

The value of written and oral corrective feedback in English as a foreign language has been acknowledged in the research literature for decades. Yet, we know little about perceptions of meaningful grammar feedback in courses of further education for in-service primary school teachers (grades 1-7). Thus, the aim of the present qualitative case study is to analyse in-service teachers' reasons for favouring certain feedback types and modes and the role of such feedback in their learning ecologies. This study used a qualitative multimethod design. Three data collections served to answer the main research question. One comprised an analysis of four essays written by seventeen in-service teachers during the autumn and spring terms, the other involved three classroom observations and individual stimulated recall interviews with these informants. While the interviews followed thematic analysis, the feedback analysis drew upon a more variable-oriented approach (descriptive quasi-statistics). Surprisingly, all in-service teachers liked unfocused and direct feedback because they expected feedback to be like real-world writing with a high degree of accuracy. Furthermore, the findings indicate a lack of oral classroom feedback and a generally high appreciation of metalinguistic feedback that helped them know the causes of the errors. Theories on agency and learning ecologies were integrated with feedback and language development theories. The findings demonstrate the importance of a varied use of feedback types and modes, which create important moments in in-service teachers' learning trajectories. Combining theories on learning ecologies with language development theories, this study broadens discussions on how to improve feedback quality.

Up and Downsides of an Austrian Language Screening Instrument - Findings from Teachers' Perspective
Keywords: Assessment Methods, At-risk Students, Foreign and Second Language Acquisition, Migrant / Refugee and Minority students
Presenting Author: Sepideh Hassani, University of Vienna, Austria; **Co-Author:**Marie Gitschthaler, University College of Teacher Education Vienna/Krems, Austria; **Co-Author:**Susanne Schwab, University of Vienna, Austria

Given the increasing number of students with migration biography and the educational inequality they face, models for promoting the language of instruction have become popular. In Austria, in 2018 'German support classes' and 'German support courses' have been installed as language support models in order to respond to this need. To decide if a child needs this specific support, students have to be tested using the MIKA-D screening instrument. The presentation offers insights into teachers' and school principals' perceptions of the MIKA-D screening. Within study 1.716 participants in a quantitative survey. Results indicated that participants' perception of MIKA-D is rather ambivalent. Study 2 included interview data from 13 teachers. The results of the thematic analysis analyses emphasized these ambivalences. Teachers reported certain benefits of the language screening instrument, but criticized the long-term educational and social disadvantages for students with migration biography.

Using Qigong mind-body intervention to reduce culturally diverse students' foreign language anxiety
Keywords: Anxiety and Stress, Foreign and Second Language Acquisition, Migrant / Refugee and Minority students, Well-being
Presenting Author: Wai Ming Cheung, The University of Hong Kong, Hong Kong; **Co-Author:**Wing Yan So, HKJC Centre for Suicide Research and Prevention, Hong Kong; **Co-Author:**Hector Wing-hong Tsang, The Hong Kong Polytechnic University, Hong Kong

Background: A growing number of ethnic minority families, many of whom do not speak Chinese, are immigrating to and residing in Hong Kong. To fully succeed in school and participate in school activities, culturally diverse children must gain competence in the Chinese language. However, many of these children experience foreign language anxiety. Aims: To help culturally diverse students reduce foreign language anxiety in learning Chinese through the use of qigong as a mind-body intervention.Sample: A total of 50 Grade 4 to 6 students from South Asian countries participated in the study. Methods: A randomized controlled trial was conducted in a school setting, where culturally diverse students were placed at random into an intervention group or a control group. The intervention group took part in an innovative qigong program, while the control group continued with their usual routine. Assessments were conducted at baseline, post-

intervention, and 6 months after intervention.Results: This study did not identify significant differences in foreign language anxiety or academic achievement in the Chinese language between or within the groups. However, a significant within-group difference in salivary cortisol level was noted for the intervention group. No significant differences were identified for stress-related physiological outcomes. Conclusion: This study provides evidence that qigong has an effect on the Hypothalamic-Pituitary-Adrenal (HPA) axis. This suggests that qigong can help children to regulate their emotions.

Code-Switching Behavior Indicating Heritage Language Attrition in Dual Language Learning Children
Keywords: Bilingual Education, Developmental Processes, Early Childhood Education, Foreign and Second Language Acquisition
Presenting Author: Leila Teresa Schächinger Tenés, Faculty of Psychology, University of Basel, Switzerland, Switzerland; **Co-Author:**Jessica Carolyn Weiner-Bühler, Faculty of Psychology, University of Basel, Switzerland; **Co-Author:**Alexander Grob, University of Basel, Switzerland; **Co-Author:**Robin Klaus Segerer, Faculty of Psychology, University of Basel, Switzerland

Multilingualism is (becoming) a desirable characteristic relating to various cognitive, communicative, and career benefits. Nevertheless, dual language learning children often struggle to develop both languages at a similar competence level. Particularly, after entering the educational system the language input in the societal language increases, while the heritage language input decreases leading to a language dominance shift with the societal language getting more pronounced and the heritage language becoming less developed. In extreme cases this may even lead to heritage language attrition. A marker for an unfavorable language development might be the code-switching phenomenon, which describes the ability to switch between different languages. This study aims to better understand to what extent code-switching represents an indicator for underlying dual language abilities and, whether code-switching serves as a predictor for later dual language development. Participating dual language learners (N = 107, age-range = 32-78 months) are part of a longitudinal study. At three measurement time points, parallelized and standardized language tests assess children's expressive language abilities in both languages. Their code-switching behavior is reported via parental questionnaires at the first measurement time point. Cross-sectional findings suggest children's code-switching to indicate their underlying dual language abilities (all ps.10), but to predict subsequent heritage language skills (all$p$s

Session S 13

26 August 2023 12:00 - 13:30
UOM_CR
Single Paper
Assessment and Evaluation

Educational Assessment Practices

Keywords: Classroom Assessment, Competencies, Early Childhood Education, Ethics, Feedback, Large-scale Assessment, Learning Analytics, Lifelong Learning, Mixed-method Research, School Effectiveness, Self-regulated Learning and Behaviour
Interest group: SIG 01 - Assessment and Evaluation, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Jean-Pierre Thibaut, Université de Bourgogne / Lead - CNRS, France

Perceptions of assessment: An interview study of being assessed in Swedish adult education colleges
Keywords: Classroom Assessment, Feedback, Lifelong Learning, Self-regulated Learning and Behaviour
Presenting Author: Anders Jönsson, Kristianstad University, Sweden

Assessments have been shown to influence students' learning and motivation. To avoid negative consequences, different strategies have been proposed, such as making a distinct separation between assessments for summative and formative purposes. In this way, situations are created that are exclusively formative, in which students may focus on learning without worrying about test scores or grades. This study investigates perceptions of such a context, where grading is kept separate from assessment for formative purposes. Semi-structured interviews were conducted with 19 participants at five Swedish so-called "adult education colleges." At these colleges, students' "grades" are determined as a joint decision by all the teachers together at the end of the academic year, and no grades are communicated to the participants beforehand. Data from the interviews were analyzed with qualitative thematic analysis, identifying four themes related to participants' perceptions of assessment. The results suggest that participants perceive that there is a lack of feedback on overall progress, limiting their possibilities to regulate their learning. The results also suggest that the participants do not always know when, or on what grounds, they are being summatively assessed, leading to less productive study strategies. The consequences of this particular assessment context, therefore, seem similar in several respects compared to those reported for the conventional Swedish school system, although the latter is greatly influenced by numerous summative assessment events.

Towards ethical standards for employing user-generated data in educational assessment
Keywords: Classroom Assessment, Ethics, Large-scale Assessment, Learning Analytics
Presenting Author: Fazilat Siddiq, University of South-Eastern Norway, Norway; **Co-Author:**Damian Murchan, University of Dublin, Ireland

Educational assessment has evolved profoundly during the last decade and keeps developing due to the increased potential enabled by new technologies. In particular, computer-based assessments can generate process data that record examinees' digital traces. In other words, such data can potentially provide information not only about students' competences (correct/in-correct answers or quality of responses) but also their behavior (how they respond and come to the solution). Whereas advances in analyzing such data accelerate (aided, for example, by learning analytics, machine learning, artificial intelligence/AI), ethical and legal concerns persist. This study relates the paucity of information about ethics in user-generated data in educational measurement to existing test standards that have, in part, become outdated. We conducted reviews of six widely used test standards internationally to investigate to what extent they target issues related to ethics in utilizing user-generated data. These standards acknowledge ethical issues in assessment; however, they do not address user-generated data in assessment and ethics. Consequently, we also reviewed and analyzed ethical codes and frameworks developed within the wider field of user-generated data (process data, learning analytics, AI, etc). Thematic analysis was applied to propose a draft code of ethics for including user-generated data in educational assessment.

Quality of Italian preschool. The why, how and what of preschool evaluation in Italy.
Keywords: Competencies, Early Childhood Education, Mixed-method Research, School Effectiveness
Presenting Author: Cristina Stringher, Istituto Nazionale per la Valutazione del Sistema Educativo di Istruzione e di Formazione (INVALSI), Italy

This paper presents aims, methodology and findings of a project for the development of a self-evaluation form for preschool settings in Italy. This research trajectory intended to respond to one major mandate: develop a tool and build consensus around self-evaluation in this level of education. This massive operation involved >3700 preschools in a national consultation and additional >1800 preschools in a national experimentation. Quali-quantitative data have been produced during this research journey and allow to shed light on the quality of preschools in Italy. Results of the experimentation show that preschools in Italy consider themselves of good quality: the percentage of preschools positively self-evaluating their quality ranges from 65% on the rubric concerning school-family relationships, to 84% on the wellbeing of children rubric. Considerations are made on a complex self-evaluation process and on its theoretical framework, which may be useful also for other countries undertaking a similar effort.

Session S 14

26 August 2023 12:00 - 13:30
UOM_A08
Single Paper
Teaching and Teacher Education

Citizenship Education

Keywords: Attitudes and Beliefs, Citizenship Education, Cultural Diversity in School, Curriculum Development, Mindsets, Qualitative Methods, Teacher Professional Development, Teaching Approaches
Interest group: SIG 13 - Moral and Democratic Education
Chairperson: Kim Ouwehand, Erasmus University Rotterdam, Netherlands

Enlarging space for curriculum research within citizenship education: Whole-school approach
Keywords: Citizenship Education, Cultural Diversity in School, Curriculum Development, Teacher Professional Development
Presenting Author:Özge Karakuş Özdemirci, Middle East Technical University, Turkiye; **Presenting Author:**Hanife Akar, Middle East Technical University, Turkiye

This study aims to analyse the citizenship education curriculum of Turkiye through a whole-school approach in the context of differences and diversity utilizing a multi-layered critical inquiry. The 4th-grade Human Rights, Civics, and Democracy curriculum (HRCD), including the content analysis of other 4th-grade courses, were analysed. In addition, the lived experiences and opinions of school members were obtained through semi-structured interviews and in-class and in-school observations. Interviews were conducted with 4th-grade teachers (*n*=16), school managers (*n*=10), and counsellors (*n*=10), and observations were realized in the interviewed teachers' classrooms (*n*=7) from a selection of six schools located in multicultural neighbourhoods of a Southern city in Turkiye. Findings illuminated the dominance of nationalist, authoritarian, and statist perspectives to citizenship which blocks the paths to create a democratic classroom environment where all students feel accepted regardless of their identity. However, adopting a whole-school approach and going into schools and classrooms provided a ground to see the counter-discourses, eventually used to enlarge the curriculum research in the context of citizenship education.

Views on Holocaust and Citizenship: Israeli and German Civics Teachers
Keywords: Citizenship Education, Mindsets, Qualitative Methods, Teaching Approaches
Presenting Author: Tim Zosel, University of Duisburg-Essen, Germany

The Holocaust has been described as "a rupture in *civilization" (Diner 1988), since never before* had anything like this taken place. Its commemoration takes on prominent and particular functions within the political cultures of Israel and Germany (Zuckermann 1998). These functions are related to specific official values of contemporary citizenship and democracy that are also mirrored at school, especially in citizenship education. In both countries the Shoah is of considerable importance in justifying a specific citizenship education that strengthens democracy. On the level of concrete teaching practice, it remains yet unclear, how the historical reference Holocaust is connected with citizenship conceptions of civics teachers.
The paper presents the results of an empirical qualitative and internationally comparative study intending to take a closer look at teachers' citizenship conceptions in interrelation with the views on the Shoah. Therefore, extended focus groups ("group workshops", Bremer 2004) were conducted and habitus-hermeneutically analyzed (Bourdieu 1982, Bremer & Teiwes-Kügler 2013). Overall, the results suggest that the teachers' views on the Holocaust correspond to certain group-specific citizenship experiences and moral attitudes. The findings of the study further suggest that the citizenship conceptions are accompanied by specific pedagogical goals for the future ideal citizens, which include specific pupils to citizenship and exclude others. Teachers 'make use' of the Shoah as a historical reference and projection in order to pursue their own contemporary educational goals. In Israel and Germany, however, this takes place according to different logics which will be explained in further detail in the paper.

Neutrality in times of war: Russian school in the early days of the invasion of Ukraine
Keywords: Attitudes and Beliefs, Citizenship Education, Qualitative Methods, Teaching Approaches
Presenting Author: Evgeniia Efimova, Uppsala University, Sweden

The study addresses the problem of teachers' neutrality in discussions of controversial issues in the face of extreme polarization and external political pressure. Based on 26 interviews with Russian teachers and school leadership from the first month of the invasion of Ukraine, I investigate how they made professional judgments about avoiding or engaging with the issue of the invasion, framing it, disclosing their views, and dealing with 'recommended' pro-war content. In my presentation I will show the complexities of teachers' situational decision-making and its factors, as well as highlight some predicaments of the discourse of teachers' neutrality and depoliticization of teaching.

Democratic Pedagogy: vision, perceptions and practice - principal's perspectives
Keywords: Citizenship Education, Curriculum Development, Qualitative Methods, Teaching Approaches
Presenting Author: Yifat Filo, Tel Aviv University, Israel; **Co-Author:**Benzi Slakmon, Tel Aviv University, Israel

Thirty-five years after the establishment of the first democratic school in Israel in 1987, the democratic school movement in Israel has flourished. Yet, its underlying pedagogy has not been sufficiently researched. In this study, we ask to what extent genuine democratic pedagogy can be identified. How is democratic teaching and learning perceived? What constitutes a democratic curriculum, and how does it differ from a curriculum in a non-democratic school? What type of democracy is pursued and how does it manifest in democratic structures, visions, and values? In this paper we analyze principals' perspectives regarding these issues in order to understand the ways in which their educational agendas shape their practice and how their perspectives shape the specific kind of democracy they portray. Based on thematic analysis and a democratic dimension framework we analyzed interviews with veteran democratic school principals in Israel. Our findings point to a humanistic existentialist perception and to the fact that there is ambiguity regarding democratic pedagogy, teaching and learning. The Israeli democratic schools are within the liberal civic education tradition (Sant, 2019), a derivative of liberal democracy, which is currently undergoing a global crisis. Implications of the findings for democratic schools and for democratic education for new visions of democracy are discussed.

Session S 15

26 August 2023 12:00 - 13:30
UOM_A04
Single Paper
Higher Education, Motivational, Social and Affective Processes

University Students' Anxiety, Stress, and Coping during the Pandemic

Keywords: Anxiety and Stress, Emotion and Affect, Higher Education, Pandemic, Quantitative Methods, Well-being
Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion
Chairperson: Nikolaos Fachantidis, Greece

University students' stress during the pandemic: Longitudinal evidence from two academic years
Keywords: Anxiety and Stress, Higher Education, Pandemic, Quantitative Methods
Presenting Author: Elisabeth Höhne, Leibniz Universität Hannover, Germany; **Co-Author:**Jannika Haase, Leibniz University Hannover, Germany; **Co-Author:**Lysann Zander, Leibniz University Hannover, Germany

With the rapid shift to online teaching and contact restrictions, the COVID-19 pandemic has had a large impact on university students worldwide. Although there is plenty of evidence regarding the negative effects of the pandemic on students' mental health at the onset of the pandemic, research on the medium- and long-term effects of the pandemic remains scarce. In the present study, we thus examined students' perceived stress at seven time points during the pandemic from June 2020 to June 2022 in Germany, with a specific focus on the period when universities returned to in-person classes in the winter semester of 2021/22. Our results show a decrease in students' stress levels upon their return to in-person classes at university in our overall sample (*N*=2,920). In a longitudinal subsample (*n*=205), however, we found no significant intraindividual changes from our first time point to the six subsequent time points. We discuss potential explanations for our findings and future research directions.

Psychological distress, anxiety and depression in university students during the COVID-19 pandemic

Keywords: Anxiety and Stress, Emotion and Affect, Higher Education, Well-being
Presenting Author: Maria Koushiou, University of Nicosia, Cyprus; **Co-Author:**Alexandros Kapatais, University of Nicosia, Cyprus; **Co-Author:**Nuno Ferreira, University of Nicosia, Cyprus; **Co-Author:**Marios Adonis, University of Nicosia, Cyprus

Objective: Recent assessments among university students have shown an increase in their anxiety and depression levels during the COVID-19 pandemic (Liu, et al., 2020; Alam, et al., 2022). The aim of this study is to estimate the prevalence rates of depression, anxiety and distress symptoms in university students and further explore the influence of gender, age, level of studies, psychological flexibility, and fear for contracting COVID-19 in the expression of these symptoms.
Method: A total of 339 students completed a battery of questionnaires in the context of a campus-wide campaign conducted between October 10, 2020 - May 1, 2021. Multiple regression analyses were run to examine the above-mentioned predictors separately for distress, anxiety and depression as measured via the Depression Anxiety and Stress Scale-21 (Brown, et al., 1997).
Results: Based on the results, 57.2% of the students reported mild to extremely severe depression, 67.3% reported mild to extremely severe anxiety and 69.6% reported mild to extremely severe distress. Level of studies and psychological flexibility systematically appeared as significant predictors for all three-symptom categories. Fear of contracting COVID-19 significantly predicted distress levels among students.
Conclusions: Undergraduate students and students with lower psychological flexibility report higher levels of depression, anxiety and distress. Future research should focus on delineating the emotional processes that are associated with these symptoms during times of uncertainty that students currently face due to COVID-19's unpredictability. Further study and evidence-based interventions, targeting psychological flexibility, should proceed to reduce more severe risks among vulnerable university students.

Strivings and concerns during the pandemic: University students' perfectionism, stress, and coping
Keywords: Anxiety and Stress, Higher Education, Pandemic, Well-being
Presenting Author: Heta Tuominen, University of Eastern Finland, Finland; **Co-Author:**Riikka Hirvonen, University of Eastern Finland, Finland; **Co-Author:**Henriikka Juntunen, University of Helsinki, Finland; **Co-Author:**Jaana Viljaranta, University of Eastern Finland, Finland; **Co-Author:**Markku Niemivirta, University of Eastern Finland, Finland

The rapid transition to remote teaching due to the COVID-19 pandemic affected university students' studies and well-being. Despite the similar circumstances, students likely reacted differently to the challenges of this unprecedented situation and coped with it using different kinds of strategies. As this new situation was presumably reflected also in the level of goals students set for themselves and in the related self-evaluations and concerns, we assumed that examination of students' perfectionistic tendencies might provide added value. First, we investigated the level of Finnish university students' (N = 737) stress, coping strategies, and recovery after the transition to remote teaching in Spring 2020. Next, employing a person-oriented approach and latent profile analysis, we examined how students' differential emphasis on perfectionistic strivings and concerns (i.e., perfectionistic profiles) link with these. On average, students reported more challenge stress than hindrance stress. The most typical coping strategies were acceptance and positive framing, while seeking others' support was least typical. However, these somewhat varied in relation to the four perfectionistic groups identified: *ambitious* (36 %), *perfectionists* (25 %), *non-perfectionists* (24 %), and *concerned* (15 %). Most stress was reported by perfectionists and concerned. Ambitious and perfectionists favoured active coping and planning, while ambitious and non-perfectionists emphasised acceptance and positive framing. Perfectionists reported inferior recovery compared to other students. Our findings suggest students' differential emphasis on their goals and related concerns to be linked with their stress experiences during the pandemic. Particularly a combination of high strivings and concerns seems to threaten university students' well-being.

COVID-19 and University Students: Development of the Robust - Pandemic Coping Scale (R-PCS)
Keywords: Emotion and Affect, Higher Education, Pandemic, Quantitative Methods
Presenting Author: Daniela Raccanello, University of Verona, Italy; **Co-Author:**Giada Vicentini, University of Verona, Italy; **Co-Author:**Emmanuela Rocca, University of Verona, Italy; **Co-Author:**Roberto Burro, University of Verona, Italy

The COVID-19 pandemic has provoked an increase in both psychopathological symptoms and negative emotions. Examining how university students coped with the pandemic can give indications about how to intervene to support them. Coping is a multi-component process referring to all the actions marshaled to face the traumatic impact of stressful events. We studied how university students coped with the first wave of the COVID-19 pandemic, by developing the Robust – Pandemic Coping Scale (R-PCS), deputed to measure coping strategies related to epidemics/pandemics. We involved 2,987 Italian university students who participated to an online survey, including the R-PCS and the Power to Live with Disasters Questionnaire (PLDQ). We conducted exploratory and confirmatory factor analyses, which supported the goodness of a 4-factor model (i.e., Despair, Adjustment, Proactivity, Aversion) for the R-PCS, invariant across gender and age. Then, we applied the Rasch analysis. The correlations with the PLDQ supported also the criterion validity of the scale. Therefore, we described the development of a new, brief, and psychometrically sound instrument to assess students' coping strategies related to epidemics/pandemics. Our study revealed also gender and age differences: Scores were higher for Despair, Adjustment, and Proactivity for females; for Aversion for males; and for Proactivity for students older than 23 years. At the applied level, the R-PCS could be used to investigate the efficacy of evidence-based interventions aiming at supporting students during the pandemic or to monitor their reactions. And it could also be a basis for developing further scales for assessing coping related to other disasters.

Session S 16

26 August 2023 12:00 - 13:30
AUTH_T002
Single Paper
Assessment and Evaluation, Cognitive Science, Instructional Design, Learning and Instructional Technology

Metacognitive Processes and Self-regulated Learning and Behaviour

Keywords: Achievement, Assessment Methods, Cognitive Skills and Processes, Computer-assisted Learning, E-learning/ Online Learning, Health-care Education, Metacognition, Motivation, Primary Education, Problem Solving, Reading, Secondary Education, Self-regulated Learning and Behaviour
Interest group: SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Elisa Vilhunen, University of Helsinki, Finland

Revision and psychometric properties of the Metacognitive Awareness scale MARSI-2fR
Keywords: Assessment Methods, Metacognition, Reading, Secondary Education
Presenting Author: Aristea Mavrogianni, University of Crete, Greece; **Co-Author:**ELENI VASILAKI, University of Crete, Greece; **Co-Author:**Ioannis Spantidakis, University of Crete, Greece

The learning process urgently needs to be redefined and therefore reformed. For that to happen, we must think critically about how students study. Thus, in the current study, we formed a new alternative factorization of the internationally acknowledged MARSI (Metacognitive Awareness of Reading Strategies Inventory) scale for the Greek secondary population. We shed new light on how Greek students read academic or school-related material. In the revised version of MARSI-2fR, the new structure consisted of two factors comprised of eight items: the textor subscale for text-oriented reading strategies (F1) and the textout subscale for extratextual reading strategies (F2). These two factors (F1 & F2), referring to students' reading habits, tend to be associated with the Greek national curriculum. The results shed new light on how students read academic or school-related material and provide evidence to facilitate redefining learning. The confirmatory factor analysis and the psychometric evaluation of the MARSI-2fR scale resulted in a valid and reliable tool. Such tools are needed to clarify the learning process and ease the way for the necessary educational transformations.

Metacognitive Awareness Activation and Effortful Problem Solving
Keywords: Achievement, Cognitive Skills and Processes, Metacognition, Motivation
Presenting Author: Ines Zeitlhofer, University of Salzburg, Austria; **Co-Author:**Joerg Zumbach, University of Salzburg, Austria; **Co-Author:**Judith Schweppe,

University of Passau, Germany

Research on cognitive load suggests that novice learners should be confronted with tasks that keep cognitive load low rather than with complex tasks that increase cognitive load. Nevertheless, learning approaches like the desirable difficulties framework or productive failure show that effortful processing can lead to improved learning outcomes. In an experiment, we investigated whether the degree of metacognitive awareness activation and learners' motivation affect the impact of effortful learning on learning outcomes. Therefore, ninety-eight university students completed the Tower-of-Hanoi (ToH) problem-solving task with variating difficulty levels. After each subtask metacognitive awareness activation was assessed. Results support the central role of metacognitive awareness activation for deep cognitive processing.

Get a Cue! How Metacognitive Prompts Affect the Role of Mental Effort in Generative Activities
Keywords: E-learning/ Online Learning, Health-care Education, Metacognition, Self-regulated Learning and Behaviour
Presenting Author: Valentin Riemer, Ulm University, Germany; **Co-Author:**Simona Weber, Ulm University, Germany; **Co-Author:**Tina Seufert, Ulm University, Germany

Mental effort invested in generative activities can serve as a cue for learners to make judgements of learning (JOL). However, whether mental effort is diagnostic for actual learning performance (cue diagnosticity) and, thus, facilitates JOL accuracy, largely depends on what that effort is aimed at. Effort actively invested in metacognitive monitoring may predict actual learning, whereas effort invested to cope with passively experienced load is less diagnostic. In this study, metacognitive prompts were used to guide learners to actively invest effort into metacognitive monitoring during generative activities of varying complexity. In a quasi-experimental between-within design, $N = 72$ medical and non-medical apprentices engaged in an online endoscopy training and were either assigned to a prompting or a control condition. In both conditions, learners engaged in generative activities of high (mapping) and low complexity (keyword generation). Results showed that prompting led to an increased cue diagnosticity of actively invested effort. However, this did not result in increased JOL accuracy in the prompting condition. Instead, JOL accuracy varied between generative activities and was higher for mapping than keyword generation. Possible explanations lie in the patterns of cue diagnosticity and learners' cue utilization of active effort and passive load.

The Structure of Procedural Metacognition in Middle Childhood: An Argument for a Unitary Factor
Keywords: Metacognition, Primary Education, Problem Solving, Self-regulated Learning and Behaviour
Presenting Author: Mariette van Loon, University of Zurich, Switzerland; **Co-Author:**Ulrich Orth, University of Bern, Switzerland; **Co-Author:**Claudia Roebers, University of Bern, Switzerland

The present study aimed to obtain insights into the structure of procedural metacognition (i.e., the capacity to monitor and control learning) in middle childhood. Children (151-second graders and 174 fourth graders completed three tasks: A Kanji memory recognition task, a text comprehension task, and a secret code memory recall task. Monitoring accuracy, control accuracy, and performance scores for these tasks were used to create latent factors in structural equation models, to compare various hypothetical structures of metacognition. Firstly, we addressed whether monitoring, control, and performance are shared across tasks (i.e., indicate generalizable skills) or whether there is evidence that these skills are also task-specific. Findings show evidence for both generalizable and task-specific components. Moreover, we investigated to what extent metacognitive skills are (in)separable from primary task performance. A one-factor model, with monitoring, control, and performance all loading on the same factor, provided a good fit. Moreover, we investigated to what extent monitoring and control are unitary or distinguishable skills. The 2-factor model, in which monitoring and control indicators loaded on a metacognition factor, and performance indicators loaded on a performance factor, fitted the data better than the 3-factor model, with different factors for monitoring and control. However, the 1-factor model still appeared to be the best-fitting model for our data, and the factor loadings did not differ between age groups. This may indicate that metacognitive skills and cognitive skills are, to a large extent, unitary. Possibly, training performance may support metacognition and vice versa. Future research could investigate this.

Metamotivational scaffolding in a digital learning environment
Keywords: Computer-assisted Learning, Metacognition, Motivation, Self-regulated Learning and Behaviour
Presenting Author:Jörg Zumbach, University of Salzburg, Austria; **Co-Author:**Simone Reitstaetter, University of Salzburg, Austria; **Co-Author:**Bettina Mann, University of Salzburg, Austria; **Co-Author:**Ines Zeitlhofer, University of Salzburg, Austria; **Co-Author:**Hermann Astleitner, University of Salzburg, Austria

We investigated the influence of metamotivational prompts on performance in a digital learning environment. Prompts represent forms of metacognitive scaffolding that help learners to deal with topics more intensively. Following Self-Determination Theory, our experimental study examines whether metamotivational prompts affect externally and self-controlled motivation, intrinsic and germane cognitive load as well as knowledge acquisition. 70 high school students participated in the study, where they had to work self-regulated with web-based training. In the experimental condition, participants received two metamotivational prompts during learning. The results show that participants only had higher self-controlled motivation and slightly achieved better learning outcomes when prompts were used sensibly. Discussions concern future research on the adaptivity of metamotivational prompts in relation to learners´ traits.

Session S 17

26 August 2023 12:00 - 13:30
AUTH_TE2
Single Paper
Learning and Social Interaction, Learning and Special Education

Social Participation and Inclusion of Students with Special Educational Needs

Keywords: At-risk Students, Cognitive Development, Emotion and Affect, Inclusive Education, Peer Interaction, Secondary Education, Social Aspects of Learning and Teaching, Social Development, Social Interaction, Special Education
Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 15 - Special Educational Needs
Chairperson: Anne Haarala-Muhonen, University of Helsinki, Finland

Social inclusion and teacher-student-relationship quality at the lower secondary level
Keywords: Emotion and Affect, Inclusive Education, Secondary Education, Social Aspects of Learning and Teaching
Presenting Author: Giuliana Pastore, Zurich University of Teacher Education, Switzerland; **Co-Author:**Reto Luder, Zurich University of Teacher Education, Switzerland; **Co-Author:**Andre Kunz, Zurich University of Teacher Education, Switzerland; **Co-Author:**Ariane Paccaud, Pädagogische Hochschule Zürich, Switzerland

Inclusive schools should create a learning environment, which allows a healthy cognitive and psychosocial development of all students through both optimal learning support and effective school engagement and participation, regardless of individual performance, language, learning and behavior disposition or disability. The subjectively perceived inclusion in the everyday school life of students can be regarded as a key determinant of successful school inclusion. For this goal, the relationship between teachers and students (T-S-R) may be crucial. Research in this area emphasizes the significant role of emotional aspects of these relationships as strong predictors of learning achievement and well-being. Hence, emotional aspects can be considered as a key aspect of quality of T-S-R. Nevertheless, in the context of research on inclusion, they have been rarely examined and a theoretically sound conceptualization for empirical research is still missing. The present project investigates the link between T-S-R quality and students' social inclusion in Swiss secondary schools that currently shift to inclusive settings. For this goal exploratory and confirmatory factor analysis with two different samples were used to first support the theoretical structure of the measurement of T-S-R quality. In a second step autoregressive models (ARM) answered the question of whether the quality of the relationship with the teachers can explain the students' perception of their own social inclusion. Finally general linear models (GLM) traced out the development of both social inclusion and the T-S-R quality during the secondary school years in relation to the SEN-status of the students.

Inclusive education of students with emotional and behavioral disorders: A systematic review
Keywords: Cognitive Development, Inclusive Education, Social Development, Special Education

Presenting Author: Sonja Krämer, Christian-Albrechts-University of Kiel, Germany; **Co-Author:**Julia Becherer, Christian-Albrechts-University of Kiel, Germany; **Co-Author:**Friederike Zimmermann, Kiel University, Germany

This systematic review examined outcomes of students with emotional and behavioral disorders (EBD) and their peers in more inclusive educational settings compared with more segregated ones. Cognitive (e.g., results in standardized achievement tests) and psychosocial outcomes (e.g., self-concept, anxiety) were considered. We searched relevant databases and conducted a backward and forward search of relevant articles and previous reviews. Only studies that compared students with and without EBD in more inclusive settings to a comparison group of students with and without EBD in segregated educational settings were included. In total, we summarized the results of $k = 19$ primary studies with $N = 37{,}689$ students and $n = 198$ effects. Evidence suggests that students with EBD benefit slightly from inclusive education compared with segregated education in terms of cognitive outcomes. Regarding psychosocial outcomes for students with EBD, the results are less consistent but indicate neutral to positive effects in favor of inclusive education. For the peers without EBD, concerning cognitive outcomes, there were predominantly no differences between the educational settings or slightly positive effects in favor of inclusive education. Regarding psychosocial outcomes, there were some neutral but also negative effects for more inclusive settings. We consider a possible selection effect with students diagnosed with mild to moderate EBD being more likely to be educated inclusively compared to students with severe EBD, and discuss the current state of research.

Social participation of students with behavior problem – a peer group perspective
Keywords: At-risk Students, Peer Interaction, Social Development, Social Interaction
Presenting Author: Marleene Rytioja, University of Eastern Finland, Finland; **Presenting Author:**Kristiina Lappalainen, University of Eastern Finland, Finland; **Presenting Author:**Hannu Savolainen, University of Eastern Finland, Finland

Peer relationships are a significant social environment in children's life and children spend an enormous time to interacting with their peers during school days. Earlier study with same data with 3th graders revealed that children's sociometric status is connected to their behavioral and emotional problems. Children in rejected and controversial status groups assessed to have more behavioral and emotional problems compared to their more popular counterparts. The purpose of this study was to explore are the members of children's peer groups similar on the basis of their behavioral and emotional characteristics, behavior at school or academic achievement. Results show that the members of children's peer groups resemble each other by their behavioral and emotional strengths and teacher rated behavior at school but not by their academic achievement or behavior problems. The within peer-group similarity in behavior is not explained by children's behavioral and emotional strengths but by their gender. The members of girls' peer groups get better behavioral assessment from their teachers compared to the members of boys' peer groups.

Social participation of children and adolescents with intellectual disabilities in sport clubs
Keywords: At-risk Students, Peer Interaction, Social Development, Social Interaction
Presenting Author: Carmen Zurbriggen, University of Fribourg, Switzerland; **Presenting Author:**Simone Schaub, University of Teacher Education in Special Needs, Switzerland; **Co-Author:**Mireille Audeoud, Hochschule für Heilpädagogik Zürich, Switzerland; **Co-Author:**Matthias Lütolf, University of Teacher Education in Special Needs HfH Zurich, Switzerland; **Co-Author:**Anne Stöcker, University of Luxembourg, Luxembourg; **Co-Author:**Christina Arn, University of Teacher Education in Special Needs HfH Zurich, Switzerland

The Unified programme of Special Olympics unites athletes with and without intellectual disabilities and supports the inclusive sport clubs in adapting their training accordingly. The pilot study aimed to investigate the social participation of children and adolescents who train in Unified sports clubs in one Swiss Canton, both from the perspectives of the children and adolescents themselves and from the perspective of significant adults. Social participation was assessed by means of the Experience Sampling Method. Ten children and adolescents with intellectual disabilities, their parents, Unified trainers, and sports teachers in school provided daily information on the momentary subjective experiencing of involvement and participation-related characteristics in various situations during eight weeks, with 413 measurement occasions in total. The results of the pilot study will be presented and discussed in terms of their significance for inclusion.

Session S 18

26 August 2023 12:00 - 13:30
UOM_R01
Poster Presentation
Instructional Design, Learning and Social Interaction, Motivational, Social and Affective Processes

Minority Students, Foreign Language Acquisition and Multicultural Education

Keywords: Assessment Methods, Early Childhood Education, Emotion and Affect, Foreign and Second Language Acquisition, Instructional Design, Interest, Migrant / Refugee and Minority students, Motivation, Multicultural Education, Primary Education, Qualitative Methods, Self-efficacy, Teacher Professional Development, Tool Development, Writing/Literacy
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 06 - Instructional Design, SIG 08 - Motivation and Emotion, SIG 12 - Writing
Chairperson: Anna-Lena Godhe, Jönköping University, Sweden

The benefits of self-efficacy for interest in the short and longer-term.
Keywords: Emotion and Affect, Foreign and Second Language Acquisition, Interest, Self-efficacy
Presenting Author: Luke K. Fryer, The University of Hong Kong, Hong Kong; **Co-Author:**Nicholas Bovee, Kyushu Sangyo University, Japan; **Co-Author:**Kaori Nakao, Seinan Gakuin University, Japan; **Co-Author:**Shuichi Ozono, Kyushu Sangyo University, Japan

The linkages between students' self-efficacy beliefs and interest are well established by both theory and a growing body of empirical research. This firm foundation and the inherently developmental nature of learning in classrooms necessitates a deeper look at how changes in students' self-efficacy beliefs impact their interest in learning both across a course of study and in the longer-term. This study tests the longitudinal contribution of students' self-efficacy beliefs' latent growth for their interest in studying in a specific domain in the shorter- (36-weeks) and longer-term (80-weeks). This study was conducted across four semesters (two academic years) of compulsory foreign language courses at one private Japanese university. In total, data was collected across eight time points, primarily within weekly e-learning exercises. Attendance, longitudinal standardised achievement, and domain interest were modelled as outcomes of a latent structural equation model which included a latent curve for self-efficacy beliefs for the course of study (four data points, 36-weeks). Results confirm the paired roles of baseline and growth rate of self-efficacy beliefs within the growth of students' domain interest. Over the longer-term, the relative importance of growth rate increased indicating its importance and highlighting its under-theorised role within important learning outcomes such as interest.

Effectiveness of Instructional Design Focusing on Sentence Construction and Ambiguity
Keywords: Foreign and Second Language Acquisition, Instructional Design, Motivation, Self-efficacy
Presenting Author: Mika Igarashi, Hosen College of Childhood Education, Japan

In this study, we conducted classes aimed at developing the metalinguistic ability of 66 sixth-grade elementary school students and verified the effectiveness of the instructional design. All the students participating in this study were native speakers of Japanese. Metalinguistic ability refers to the ability to become aware of the structure and function of language itself and has been shown to play an important role in foreign language learning. Teachers in charge of English and Japanese at the school conducted the intervention classes. The intervention mainly dealt with word order, sentence structure, and ambiguity, and was conducted in five classes (each session was 45 minutes long) on separate days. The classes were conducted in Japanese, and foreign language expressions, including English, were introduced as necessary. The participants answered a metalinguistic ability test and a questionnaire on language learning (motivation and beliefs) before and after the intervention. Pre- and post-comparison results showed a significant increase in metalinguistic ability test scores, while no significant positive change was found in motivation and beliefs. The result suggests that the present instructional design contributed to the improvement of the students' metalinguistic ability.

Developing contextualised oral language assessments: mapping the local within the local
Keywords: Assessment Methods, Early Childhood Education, Multicultural Education, Tool Development
Presenting Author: Joshua McGrane, The University of Melbourne, United Kingdom; **Co-Author:**Athina Ntalli, University of Oxford, United Kingdom; **Co-Author:**Usha M N, The Promise Foundation, India; **Co-Author:**Sanjana Nagendra, The Promise Foundation, India; **Co-Author:**Megha K, Manipal Academy for Higher Education, India; **Co-Author:**Siyu Ma, University of Oxford, United Kingdom; **Co-Author:**Gideon Arulmani, The Promise Foundation, India; **Co-Author:**Sonali Nag, University of Oxford, United Kingdom

Innovations in the localising of language assessments have been slow relative to other areas such as math assessment. This may be attributed to a challenge that is more acute in language assessment - the need for a coherent test construction framework for tests to capture well the features of a language and be sensitive to the setting, especially when there are dialects and multilingualism. In this paper six tests of oral language are presented as exemplars of the challenges to localisation in language assessment: tests of vocabulary, morphosyntax and narrative expression. Test localisation is examined in the context of four domains: a) construct b) context c) meaningfulness and d) psychometric properties. The results are mapped against robustness at the level of psycholinguistic characteristics of the target language (construct definition), context (languages in the setting and medium of language instruction), meaningfulness (user engagement, and usability) and psychometric properties (factoring in the local social stratifiers *within* the local context). Taken together, a proposal is made for developing oral language assessments that acknowledges the multi-faceted nature of both the language domain and the localisation process. This work is of particular relevance to assessment in the less-studied languages of low- and middle-income countries.

Scaffolding plurilingual students' learning through a functional writing roleplay in grade 1
Keywords: Migrant / Refugee and Minority students, Primary Education, Teacher Professional Development, Writing/Literacy
Presenting Author: Kimberly Norrman, Uppsala University EDU, Sweden

The aim of the study is to create knowledge on how a functional writing approach in a teacher professional development intervention creates teaching and learning opportunities for plurilingual students. Functional writing here is understood as writing used as a means of learning and communicating. The purpose and audience of the writing is just as important as learning the alphabetic code for writing development (Hall, 2013). The study analyzes six forms of interaction in a writing focused, roleplay activity (teacher-student, teacher-class, teacher- group, student-student, student-artifact, teacher+ artifact). This study is interested in both how teachers provide support and meaning making opportunities but also instances where plurilingual use their own linguistic agency and strategies to communicate, complete the roleplay task or make meaning. The research questions addressed are: What do Swedish teachers do to facilitate meaning making in interaction for plurilingual students during a functional writing intervention?What do plurilingual students do in order to create meaning in interaction during a functional writing intervention? The preliminary results emerging from the inductive thematic analysis are that roleplay allows for teachers to support plurilingual students' learning in a seamless and effective manner. Roleplay opens up meaning making opportunities for plurilingual students through encouraging interaction and allowing for scaffolding from teachers, peers and the plurilingual students themselves.

Intercultural interpreter-mediated parent-educator talks in childcare centres
Keywords: Early Childhood Education, Migrant / Refugee and Minority students, Multicultural Education, Qualitative Methods
Presenting Author: Fabienne Bohler, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Franziska Vogt, St.Gallen University of Teacher Education, Switzerland

The participation of children with a migration background in early childhood education can facilitate integration into society (Edelmann, 2018). However, educators can experience cooperation with families, who do not speak the local language well, as challenging (Sulzer, 2013). Through language "power imbalance, social asymmetries and norms" are discursively produced (Panagiotopoulou, 2017). Intercultural interpreters can act as a link between parents and educators and contribute to balancing the asymmetrical power imbalance (Moreno, 2018).There is almost no existing research on parent-educator talks supported by intercultural interpreters in early childhood education. The study therefore seeks to explore the structure, content, and social interaction of the talks. The study is embedded within a large project promoting language fostering in childcare centres for second language learners. Experiences show that many childcare centres do not focus educator-parent cooperation systematically and have difficulties to address complex topics due to language barriers.The qualitative study is based on audio recordings of the talks. For data analysis, Grounded Theory Method is employed. The results will provide evidence on the characteristics of interactions between parents and educators supported by intercultural interpreters in childcare centres.

Session S 19

26 August 2023 12:00 - 13:30
UOM_R02
Poster Presentation
Cognitive Science, Higher Education, Learning and Instructional Technology, Learning and Special Education

Comprehension of Text and Graphics

Keywords: Cognitive Skills and Processes, Comprehension of Text and Graphics, Critical Thinking, Digital Literacy and Learning, Eye Tracking, Higher Education, Instructional Design, Motivation, Multimedia Learning, Parental Involvement in Learning, Quantitative Methods, Reading, Secondary Education, Special Education, Writing/Literacy
Interest group: SIG 02 - Comprehension of Text and Graphics
Chairperson: DOMNA KAKANA, Aristotle University of Thessaloniki, Greece

Improving children's visual search for answer to questions in a text through induction tasks
Keywords: Cognitive Skills and Processes, Comprehension of Text and Graphics, Eye Tracking, Reading
Presenting Author: Sabine FEVIN, Centre de Recherches sur la Cognition et l'Apprentissage (CeRCA) - CNRS - Université de Poitiers - Université de Tours, France; **Co-Author:**Christine Ros, Centre de Recherches sur la Cognition et l'Apprentissage (CeRCA) CNRS - Université de Poitiers - Université de Tours, France; **Co-Author:**Delphine Oger, Centre de Recherches sur la Cognition et l'Apprentissage (CeRCA) CNRS - Université de Poitiers - Université de Tours, France; **Co-Author:**Nicolas Vibert, Centre de Recherches sur la Cognition et l'Apprentissage (CeRCA), CNRS, Université de Poitiers, Université de Tours, France

Visual search for verbal information is a complex activity for young readers. This study focused on whether asking 10 years old children to elaborate on the meaning of a question before to search for the answer could foster access to the meaning of words during text processing, and whether this manipulation might increase children's question-answering accuracy. Children were asked to memorize a question before performing an induction task involving either the spelling ("perceptual" task) or the meaning ("semantic" task) of the words used in the question. Then, they searched for the answer through short texts. Both surface questions and inferential questions were used. After performing the semantic rather than the perceptual induction task, children made fewer errors (14.5% versus 21.5%, $\chi^2(1)=3.88$, p

How does structured notes in the form of a graphic organizer influence students' achievement?
Keywords: Higher Education, Instructional Design, Multimedia Learning, Quantitative Methods
Presenting Author: Tiphaine Colliot, CeRCA UMR7295 Université de poitiers, France; **Co-Author:**Karima Mekki, Université de Poitiers, France

The purpose of the present study was to assess the effects of different instructional designs of a pedagogical document on students' achievement and note-taking activity. 81 students studied a pedagogical document in one out of four condition: document-only, document accompanied by a graphic organizer, document accompanied by a partial graphic organizer to be completed, document with the instruction of generating a graphic organizer. No difference of cognitive load and on the time spent studying the document were observed. Overall, results showed no significant effect of receiving a readymade graphic organizer or generating totally or partially a graphic organizer on students' achievement. Complementary analyses revealed that the quantity of notes was

significantly and positively linked to students' achievement.

Reading accuracy threshold on reading comprehension
Keywords: Cognitive Skills and Processes, Comprehension of Text and Graphics, Reading, Writing/Literacy
Presenting Author:NATALIA CALVO BLÁZQUEZ, Universidad de Salamanca, Spain; **Co-Author:**J. Ricardo García Pérez, Universidad de Salamanca, Spain; **Co-Author:**Emilio Sánchez, Facultd de Psicología, Spain

The full development of reading competence requires achieving different challenges (Alexander et al., 2012, Sánchez and García, 2021). In a language such as Spanish, the first of these challenges is to achieve reading accuracy, based on phonological awareness and the knowledge of grapheme-phoneme correspondences. Achieving this challenge is vital and supports the subsequent achievements. In a previous study it has been identify the minimum accuracy threshold that learners must reach so that the relation between oral and reading comprehension is significative. In other words, to be able to benefit from the oral comprehension skills they have. This threshold is equivalent to reading accurately 72% of a list of 40 pseudo-words. The aim of this study is to identify the number of students who are (or not) reaching this threshold in a sample of Spanish students initially assessed in 1st grade and followed up to 3rd grade, to explore the consequences of reaching (or not) this threshold in a given grade on basic comprehension skills measured in 3rd grade. Regression analyses show that reaching this threshold in 1st grade (but not in 2nd or 3rd) significantly predicts later comprehension success even controlling oral comprehension ability. Using reference thresholds can be useful for creating reader profiles and facilitating interventions to ensure subsequent success.

The role of sources in single text comprehension.
Keywords: Comprehension of Text and Graphics, Critical Thinking, Reading, Secondary Education
Presenting Author: Javier Rosales, University of Salamanca, Spain; **Co-Author:**María García Serrano, University of Salamanca, Spain; **Co-Author:**J. Ricardo García Pérez, Universidad de Salamanca, Spain

To successfully read texts and manage with the large amount of information provided now a days specially with the use of internet, being aware of the way the information is organised and the source the information comes from to interpret and manage the information seem to be important. In this line, the main goal of this study was to explore the effect of the presence of sources in single-text comprehension. 284 seventh- to tenth-grade students were divided into two groups by grades: students at lower grade levels (seventh and eighth grade), and students at higher grade levels (ninth and tenth grade). The students read a sequence and a cause-effect text and made a summary of each text. Four different text version were created for each text manipulating the signals and the sources (text with signals and without source, text with signals and source, text without signals and with source, and text without signals and without source). The results reveal that the presence of an authority source in single text does not impact directly on its comprehension but depends on the attention of reader to them and the type of texts. When the text contains organizational signals, the source can reinforce the function of those signals for the readers that pay attention to them.

Home environment factors and children's and adolescents' critical reading skills:A systematic review
Keywords: Comprehension of Text and Graphics, Critical Thinking, Parental Involvement in Learning, Reading
Presenting Author: Maria Psyridou, University of Jyväskylä, Finland; **Co-Author:**Jenni Ruotsalainen, University of Jyväskylä, Finland; **Co-Author:**Mari Manu, University of Jyväskylä, Finland; **Co-Author:**Elizabeth Balch-Crystal, University of Jyväskylä, Finland; **Co-Author:**Jenni Salminen, University of Jyväskylä, Finland; **Co-Author:**Leena Paakkari, University of Jyväskylä, Faculty of Sport and Health Sciences, Finland; **Co-Author:**Minna Torppa, University of Jyväskylä, Finland

One of the main challenges of our times is the wide and rapid spread of misinformation and disinformation. Therefore, critical reading is considered essential, and it is vital to identify factors that affect its development and foster them. Critical reading refers to the ability of the reader to identify, interpret and evaluate information from written texts that they encounter. Home environment plays a crucial role in critical reading. The aim of the current review is to synthesize the existing research on the relationship between home environment and critical reading development among children and adolescents. We also examine how critical reading skills and home literacy environment factors were defined and measured in the studies. The electronic databases Web of Science, PubMed, ERIC, EBSCO (all databases) were searched, and 4,787 records were identified. To be considered for inclusion in the review, articles had to conform to the following criteria: a) to be written in English (with no restrictions on the language of the assessment itself), b) to report empirical data, c) to be published in a peer-reviewed journal, d) participants age was from 6/7 years old (Grade 1) until 17/18 (end of school), e) to assess critical reading, f) to include home environment measures, g) to assess the association between home environment and critical reading. The analysis is still ongoing. Home environment factors that are associated with children's and adolescents' critical reading skills as well as limitations and suggestions for future work are discussed.

Comprehension of Multiple Digital Texts: a longitudinal study in third-grade primary school children
Keywords: Comprehension of Text and Graphics, Digital Literacy and Learning, Eye Tracking, Reading
Presenting Author: Anouk Bakker, Behavioural Science Institute, Radboud University Nijmegen, Netherlands; **Co-Author:**Aurora Troncoso-Ruiz, Behavioural Science Institute, Radboud University Nijmegen, Netherlands; **Co-Author:**Liesbeth Crajé-Tilanus, Behavioural Science Institute, Radboud University Nijmegen, Netherlands; **Co-Author:**Naomi Bergen, van, Behavioural Science Institute, Radboud University Nijmegen, Netherlands; **Co-Author:**Marco Ven, van de, Behavioural Science Institute, Radboud University Nijmegen, Netherlands; **Co-Author:**Jos Keuning, Cito Institute for Educational Measurement, Netherlands; **Co-Author:**Eliane Segers, Behavioural Science Institute, Radboud University Nijmegen, Netherlands

The digitization of society has instigated questions about digital reading comprehension. Many challenges and opportunities arise when trying to Comprehend Multiple Digital Texts (CMDT). It is unclear whether children can focus on what they read and reach deep levels of reading comprehension when confronted with the many opportunities and challenges accompanying digital reading. We are conducting a longitudinal study into the complex task of CMDT in children in middle and upper primary grades. The main focus of our study is the predictive value of cognitive linguistic abilities and digital exposure to CMDT, as well as the development of CMDT. Our poster will show the preliminary findings of our study's first and second waves. By gaining a better understanding of CMDT, we hope to inform and improve educational practice regarding digital reading comprehension.

In the mind of an easy-to-read author – an explorative case study of metalinguistic reasoning
Keywords: Comprehension of Text and Graphics, Motivation, Reading, Special Education
Presenting Author:Åsa Wengelin, University of Gothenburg, Sweden

Easy readers (novels) have been argued to have a positive impact on young people's reading development and are increasingly used in Swedish educational contexts, especially for demotivated teenagers and for students who are considered poor readers. (Nordenstam & Olin-Scheller, 2021). However, our knowledge about the underlying principles, structure and effectiveness of easy readers is scarce. An increased understanding of how various structural and content-related text characteristics interact in such novels is of essence for understanding the possibilities and limitations of using them for enhancing reading development, motivation and instruction. We therefore carried out an exploratory case study, focusing on metalinguistic reasoning by an experienced author of easy readers, and two editors, during the production of a new original easy reader. We were particularly interested in (a) the relation between text linguistic and structural features, and (b) and to what extent easy readers should target specific groups. Data was collected mainly by means of text-based interviews and analyzed through a hybrid process of deductive and inductive thematic analysis, that took its point of departure in three categories of potential obstacles to reading comprehension suggested by Beck et al (1984): surface structure, background knowledge needed for comprehension, and the nature, ambiguity, or confusability of the text's content. Our main results were that the participants focused more on providing the reader with necessary information in the right order and removing "redundant" information, to reduce requirements of inference making and "detours" from the main plot to environmental descriptions. Educational implications will be discussed.

Session S 20

26 August 2023 12:00 - 13:30
UOM_GYM

Roundtable
Assessment and Evaluation, Higher Education

Problem Solving and Challenge-based Learning

Keywords: Assessment Methods, Cognitive Skills and Processes, Competencies, Higher Education, Learning Approaches, Mixed-method Research, Problem Solving, Teaching/Instructional Strategies
Interest group: SIG 04 - Higher Education
Chairperson: Marcus Schrickel, Germany

Assessing the skill to solve technical problems in everyday life
Keywords: Assessment Methods, Cognitive Skills and Processes, Learning Approaches, Problem Solving
Presenting Author: Marcus Schrickel, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Carolin Hahnel, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Jennifer Stemmann, Pädagogische Hochschule Freiburg, Germany

Using everyday home automation and appliances can lead to situations where users do not possess routine actions yet to use a device in a particular way. Required skills in technical problem solving (TPS) include acquiring relevant operational knowledge and its purposeful application. TPS can be affected by a problem solver's prior knowledge and metacognitive abilities. To investigate adults' TPS, we used and refined a simulation-based computer test by Stemmann (2016) to assess the behavior of knowledge acquisition using system exploration and/or operating manuals as well the performance in knowledge application tasks. The present study focuses on validating the resulting TPS test score. We analyze the test's dimensionality and problem characteristics of complexity and transparency, which are expected to influence the items' solution probability. Further analyses concern the association of the TPS test score with the extent of knowledge acquisition via system exploration and reception of operating manuals, prior knowledge, and metacognitive accuracy. Data collection is currently ongoing, aiming at a sample of n = 280 adults. Results will be available and presented at the time of the EARLI 2023 and serve to discuss the similarities and differences between TPS and other forms of problem solving.

Assessing Collaborative Problem-Solving Skills in Higher Education: Evidence from a Case Study
Keywords: Assessment Methods, Cognitive Skills and Processes, Competencies, Higher Education
Presenting Author: Anna Trikoili, Technical University of Munich, Germany; **Co-Author:**Despoina Georgiou, Utrecht University, Netherlands; **Co-Author:**Daniel Pittich, Technische Universität München (TUM), Germany

Collaborative problem-solving (CPS) is a key competency for 21st-century learners and professionals. It is related to the way we think, learn, and work and draws upon cognitive and social domains. Although the construct has been extensively assessed in large-scale, international projects, the instruments utilized are not applicable to small-scale educational settings. The aim of the current study, which is in its preliminary phase, is first to evaluate the reliability and validity of a pilot collaborative problem-solving assessment tool. Second, to conduct an inductive content analysis of students' responses about their CPS skills, in order to investigate their development during a Master's degree program. For this case study, participants are postgraduate students in a program designed to foster 21st-century skills. We video-record students working on group assignments at the beginning and toward the end of the program. To measure the results, we utilize Hesse's et al. (2015) assessment framework. Two scorers independently assess the video recordings, using the framework's rubric. We plan to measure the pilot instruments' reliability and validity and also students' CPS scores longitudinally, to assess the program's effectiveness. Findings may have implications for other competencies development assessment tools and curriculum design.

Challenge-Based Learning in Educational Sciences: Mapping Students and Lecturers' Experiences
Keywords: Competencies, Higher Education, Mixed-method Research, Teaching/Instructional Strategies
Presenting Author: Despoina Georgiou, Utrecht University, Netherlands; **Co-Author:**Dimitra Mousa, Utrecht University, Netherlands

In our changing and diverse world, universities need to focus not only on knowledge transfer to students but also and mainly on helping them develop the necessary competencies to confidently navigate through this world. Challenge-based learning (CBL) in higher education is a transdisciplinary teaching and learning approach aiming to enhance university students' transferable competencies and skills while working on authentic and socially relevant problems. This study focuses on the development of a CBL-oriented course in educational sciences aiming to explore students' and lecturers' experiences during the course. In detail, we map lecturers' needs to successfully adopt such innovative teaching practices and explore university students' self-reported learning gains. We employed a mixed-methods design and collected data from N = 75 university students and N = 6 lecturers. Preliminary results suggest that most students experience the CBL course positively (81%), feel supported to make better connections between theory and practice (71%), and develop their professional skills (67%) and academic skills (53%). Similarly, lecturers share positive experiences about their involvement in the course but report the need to attend professional development courses on innovative teaching practices to be able to better understand their role and further support students learning. Implications about the role of university structures and future steps that are necessary to support lecturers' and students' learning will be discussed.

Session S 21

26 August 2023 12:00 - 13:30
UOM_R08
Workshop
Learning and Instructional Technology

Developing Questioning Literacy with the Question Compass

Keywords: Inquiry Learning, Instructional Design, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 20 - Inquiry Learning

Student questioning is an important self-regulative strategy which has multiple benefits for teaching and learning. However, teachers need support to help students develop their questioning literacy. In this workshop participants will be introduced to the Question Compass, a visual representation of the concept of Hypothetical Question Trajectories. Hypothetical Question Trajectories are a scaffold for teachers to develop students' questioning literacy by exploring possible questions from the perspectives of various research methodologies and learning outcomes. The hypothesis was that by exploring Hypothetical Question Trajectories, teachers would be better able to anticipate on potential student questioning and to encourage students to raise relevant, feasible questions which contribute to deeper understanding of the topic under study. To validate the hypothesis, a design-based study was conducted in which 30 teachers, ranging from kindergarten to grade 6, used the question compass to prepare and implement social science projects in their classrooms. In this highly interactive workshop an hands-on experience with the Question Compass will be alternated with the presentation of the outcomes of design-based research and the discussion of the potential of Hypothetical Question Trajectories for developing questioning literacy.

Developing Questioning Literacy with the Question Compass
Presenting Author:H.J.M. Stokhof, HAN University of Applied Sciences, Netherlands; **Co-Author:**Helma Oolbekkink- Marchand, HAN University Nijmegen, Netherlands; **Co-Author:**Jeroen Van der Linden, HAN University Nijmegen, Netherlands

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Session S 22

26 August 2023 12:00 - 13:30
UOM_A11
ICT Demonstration
Assessment and Evaluation

Smart CAT - A Smart Configurable Software Tool for Assessment

Keywords: Artificial Intelligence, Assessment Methods, Educational Technologies, Learning Analytics
Interest group: SIG 01 - Assessment and Evaluation

Please bring your own device if you are attending this ICT demonstration.Digital education provides new opportunities for active learning and can effectively support the development of complex competencies. Nevertheless, assessing such competencies require the development of assessment tools that rely on methodologies which hold educational value. One of the most promising assessment methodologies is Stealth Assessment (SA). Although SA is a proven methodology, its application is a complex, laborious, and time-consuming process that requires hardcoded solutions. To resolve this issue, a Smart Configurable Assessment Tool (Smart CAT) was developed to act as a stand-alone software solution that relies on the principles of the SA methodology. As such, Smart CAT facilitates the application of easy and flexible data-driven assessments using machine-learning (ML) technology. In specific, (a) it allows the use of numerical datasets, (b) it allows the easy arrangement of different statistical models, (c) it offers a wide range of built-in ML functions, and (d) it includes automated built-in functions for validating and verifying assessment outputs. Smart CAT has already been proven to be operational robust and empirically valid and reliable in several studies. To this end, Smart CAT can (a) be utilized on a large scale for the application of assessments in digital education, (b) it advocates the use of SA, which is a principled assessment methodology, and (c) it allows for the processing of large volumes of rich learner data for assessing competencies in digital learning environments.

Smart CAT - A Smart Configurable Software Tool for Assessment
Presenting Author: Konstantinos Georgiadis, Open Universiteit, Department of Online Learning and Instruction., Netherlands

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Session T 1

26 August 2023 14:45 - 16:15
AUTH_DC2
Invited Symposium
Instructional Design

Instructional practices for enhancing literacy skills across educational contexts

Keywords: Feedback, Instructional Design, Learning Approaches, Teaching Approaches, Vocational Education and Apprenticeship Training, Writing/Literacy
Interest group: SIG 12 - Writing
Chairperson: Liana Konstantinidou, Zurich University of Applied Sciences, Switzerland
Discussant: Ioannis Dimakos, University of Patras, Greece

In a digitized society, writing-based communication is becoming ever more important in learning, professional and every day-life contexts. At the same time, writing itself is increasingly based on quick and easy access to sources and information, which are to be understood, critically selected, combined, and transformed into a reader-oriented text. Thus, writing processes tend to more frequently include reading processes, requiring competent writers to be competent readers. The relevance of literacy skills and the integration of reading and writing is reflected in curriculum reforms that have put greater emphasis on synthesis writing and integrated reading and writing instruction across educational contexts. Concurrently, there is increased interest in writing research on the relationship between reading and writing processes and the effects of integrated reading and writing instruction on text quality. This symposium presents three studies conducted in different educational contexts: 10^{th}-grade students, Vocational Education and Training students, and undergraduate students. The first study presents the effect of feedback on synthesis writing processes and added modeling instruction on text quality and writing and reading behaviors. The second study discusses the effects of contextualized reading-to-write-tasks on students' text quality. The third study compares the efficacy of guides and rubrics as aids to the process of writing an argumentative text. The last presentation gives an overview of major distinctions in synthesis writing research and the diversity of theoretical orientations and theoretical approaches among the first three studies and beyond, and discusses how diversity and contradiction can contribute to a more complete theoretical understanding.

Effect of feedback on the processes and modeling instruction on text quality and literacy behaviors
Presenting Author: Elke Van Steendam, KU Leuven, Belgium; **Co-Author:**Gert Rijlaarsdam, University of Amsterdam, Netherlands; **Co-Author:**Nina Vandermeulen, Umeå University, Sweden; **Co-Author:**Marije Lesterhuis, UMC Utrecht, Netherlands; **Co-Author:**Sven De Maeyer, Antwerp University, Belgium

Writing a synthesis text involves the comprehension of source texts of which relevant information needs to be selected, combined and integrated into a reader-friendly and accurate synthesis text. To master these processes, writers need to acquire an insight into both their own and others' (effective) processes. One way of achieving that is by providing them with feedback on their synthesis writing processes and by having them compare these to processes which have been shown to be (more) effective (Vandermeulen et al., 2023). In the present study we replicated and extended the effect of Vandermeulen et al. (2023) by providing writers with feedback on their keystroke-logged synthesis writing activities both with and without instruction. In a within subjects' design 173 10th grade students were randomly assigned to a process feedback condition and such a condition with additional instruction with peer models of effective synthesis writing processes. The feedback was designed in line with the tenets of effective feedback (Panadero et al., 2019) and observational learning (Rijlaarsdam et al., 2008). Results show that students in both conditions significantly improved the quality of their syntheses from a first to a final writing session ànd compared to a national baseline (n=600) the effect is one year of schooling. Regarding the process data, the main finding is that students in the feedback-instruction condition had a more prominent focus on the sources as they spent more time in them and switched more often between text and sources, also compared to the baseline.

Scenario-based literacy education: effects of integrated reading and writing tasks on text quality
Presenting Author:CURTIS GAUTSCHI, Zurich University of Applied Sciences (ZHAW), Switzerland; **Co-Author:**Karin Madlener-Charpentier, Zurich University of Applied Sciences (ZHAW), Switzerland; **Co-Author:**Elsa Liste Lamas, Zurich University of Applied Sciences (ZHAW), Switzerland; **Co-Author:**Joachim Hoefele, Zurich University of Applied Sciences (ZHAW), Switzerland; **Co-Author:**Liana Konstantinidou, Zurich University of Applied Sciences, Switzerland

Many students in vocational education and training (VET) have difficulties with reading and writing. To date, there is little research on whether and how the development of VET students' writing skills may benefit from teaching approaches that integrate reading and writing. This presentation reports results from a semester-long intervention study conducted in Switzerland in 2018/19 (N = 285) in which we investigated the impact of a scenario-based integration of reading-to-write-tasks on the development of VET students' text quality. In the approach, problem-solving processes are set in motion by scenarios representing real- or work-life situations. Reading-to-write tasks form part of the student-initiated problem-solving process and result in situated argumentative writing. A positive experimental intervention effect was found, as text quality developed significantly better in the experimental group than in a matched control group ($F1,178 = 7.40$, $p < .01$, Cohen's $f = 0.20$), as measured in a pretest-posttest design. Outcomes suggest tangible benefits may result when applying this approach to literacy education in VET, particularly for academically weaker as well as for multilingual students.

How to improve argumentative synthesis writing using guides and instructional rubrics
Presenting Author: Lidia Casado Ledesma, Universidad Autónoma de Madrid, Spain; **Co-Author:**Isabel Cuevas, Autonoma University of Madrid, Spain; **Co-Author:**Mar Mateos, Universidad Autónoma de Madrid, Spain; **Co-Author:**Elena Martín, Universidad Autonoma de Madrid, Spain; **Co-Author:**Miriam Granado Peinado, Autonomous University of Madrid, Spain; **Co-Author:**Maria Luna, Universidad a Distancia de Madrid (UDIMA), Spain; **Co-Author:**Juan Antonio Nuñez, Universidad Autonoma de Madrid, Spain; **Co-Author:**Ricardo Olmos, Universidad Autonoma de Madrid, Spain

Undergraduates often struggle performing tasks such as writing argumentative syntheses from conflicting sources. To help with these difficulties, we are interested in evaluating the effectiveness of different instructional aids. Written guides help in the different phases of the process involved in these tasks, and have been employed in many studies focused on writing syntheses and argumentative texts. The effectiveness of a guide improves when accompanied by explicit strategy instruction. Besides, although rubrics have been used primarily to assess the quality of the texts, they may also be used to facilitate the use of integration strategies and self-regulation during the synthesis writing process. Objectives. (1) To compare the efficacy of a guide and a rubric as aids to the process of writing an argumentative synthesis – argument selection and integration; (2) To determine whether explicit strategy instruction enhances the effects of both tools during the intervention and after removing the aids. Method. We asked 120 university students to read four pairs of texts on controversial topics, with the objective of writing argumentative syntheses. After a pre-test, the participants received instruction according to their assigned group (explicit instruction vs. traditional). Afterwards, they wrote two new syntheses with the aid provided (Guide/Rubric). Finally, they wrote a post-test synthesis. Results. The guide facilitated the selection of arguments. Both guide and rubric promoted integration, improving the quality of syntheses. Their impact was greater when the students received explicit instruction on their use.

The Both/And of Research into Synthesis Writing
Presenting Author: Nancy Nelson, Louisiana State University, United States

Over four decades but especially in recent years, research into synthesis writing has expanded extensively. This expansion has been not only in numbers of studies but also in disciplinary affiliations of those conducting the research and locations where the research is conducted. Research into synthesis writing, also called discourse synthesis, reading-to-write, and writing from sources, is both interdisciplinary and multidisciplinary and is both international and transnational. It is characterized by diversity in theoretical orientations and concomitant diversity in research approaches. This paper, which is a historical review of this research, has two aims: (1) to describe major distinctions (either/or) in methodologies that have predominated in the specialism of synthesis writing and (2) to consider how the diversity of approaches and orientations benefits the research (both/and). A dialectical approach is employed, beginning with either/or and concluding with both/and. Foci are four major dialectical elements, which are often portrayed as contradictions or oppositional dichotomies: naturalistic context or experimental context; sources provided or sources located by writers; sources available or not available during writing; and this genre or that genre (usually report versus argument). The either/or analysis is followed by both/and, which highlights the complementary nature of the dialectical elements—the "unity in diversity." Contact between paradigms can be generative, and it can also lead to strengthening of one's own approaches. But most important is the benefit that diverse orientations and approaches give to the specialism itself: a fuller and more complex body of knowledge.

Session T 2

26 August 2023 14:45 - 16:15
AUTH_DC3
Invited Symposium

Education: Societal Change, Hope and the State of the Discipline

Keywords: Educational Policy, Emotion and Affect, Higher Education, Social Aspects of Learning and Teaching, Synergies between Learning / Teaching and Research, Well-being
Interest group:
Chairperson: Vivienne Baumfield, University of Exeter, United Kingdom
Discussant: Dominic Wyse, United Kingdom

The symposium addresses the theme of education as a hope in uncertain times by focusing on the structures and conditions impacting on how educators themselves are educated in our changing world. We present the outcomes of two research projects sponsored by BERA to provide empirical evidence to support advocacy for education as a discipline in Higher Education. The focus is on how the health of the discipline is subject to issues arising from inequalities in the recruitment and retention of staff in universities working in conditions of increasing precarity. The projects presented in the symposium form part of the 'State of the Discipline' initiative examining how the next generation of educators can be encouraged to continue to grow the size, influence, and impact of research in education. Insight into the current state of education as an academic discipline in the higher education systems of the four devolved nations of the United Kingdom facilitates analysis of the intersection of global, national and local factors of interest to the international educational research community.

Education: Societal Change, Hope and the State of the Discipline
Presenting Author: Vivienne Baumfield, University of Exeter, United Kingdom

The session will open with an overview of the issues the 'State of the Discipline' initiative seeks to address based on the contextual information provided by a systematic scoping review of the literature on the structures and processes that influence the activities of educators in higher education. This will be followed by two papers exploring inequalities in Education as a discipline in higher education. We conclude the session with the critical reflections of our discussant drawing out the points of convergence and divergence with the situation of educational researchers in European contexts and an invitation for the sharing of international perspectives on the 'State of the Discipline' amongst participants in the symposium. In providing empirical evidence on the contemporary situation of educators working in universities, the symposium makes an important scientific contribution to contemporary debates on education as an academic discipline, as a field of practice, and as a central element of social and political policy.

Exploration of In/Equalities Shown in Statistical Data of Academic Staffing in Higher Education
Presenting Author: Joanne O'Keeffe, Queen's University, Belfast, United Kingdom; **Co-Author:**Dina Zoe Belluigi, Queens University Belfast, United Kingdom; **Co-Author:**Jason Arday, University of Glasgow, United Kingdom

The study was informed by an analysis of existing statistical data on academic staffing collected by higher education institutions. Conducted in the interests of addressing inequalities, as researchers we paid attention to where the markers of sameness and difference of staff – in terms of age, sex, ethnicity/ race,

disability, religious belief and nationality – seem to have impacted on staff employment within the discipline of Education in the period from 2015-2020 in each devolved nation of England, Northern Ireland, Scotland and Wales, and how this compared with statistics of UK higher education in general. Analysis of the numbers, percentages, proportions and changes captured in the HESA data, enabled some identification of the differential and, where possible to ascertain, intersectional impacts on staff access, positioning, attainment, progression and attrition. In this presentation, highlighted findings will be shared about specific aspects of the composition of the heterogeneity of Education's academic staff members, in addition to their employment conditions. Approaching the data through the specific 'entry points' of sex, ethnicity, and nationality, findings about each grouping, intersectional impacts and related employment conditions will be shared using data visualisation. The study evidences the homogenous state of Education in the United Kingdom; the marginalisation of academic staff recorded as Black Asian and Minority Ethnic (BAME); the exclusion of academics from the majority world (or Global South); continued inequalities when it came to the flourishing of female staff; and concerns about the conditions for younger staff. Questions are raised about areas of insufficient and problematic growth in Education generally and in relation to certain social groups. While some of the patterns were consistent across the UK, differences were observed between the devolved nations which suggests care should be exercised in representations made by scholars of higher education in the United Kingdom.

The State of the Discipline: findings from a survey of education researchers
Presenting Author: Jess Pilgrim-Brown, University of Warwick/University of Bristol, United Kingdom; **Co-Author:**Tom Perry, University of Warwick, United Kingdom; **Co-Author:**Rebecca Morris, University of Warwick, United Kingdom; **Co-Author:**Emma Smith, University of Warwick, United Kingdom

Shifts in attitudes towards and support for education research from government, universities, policymakers and practitioners has seen new actors involved in the production and use of education research, and enhanced debates about its status, value and contribution to society. However, there have only been limited recent attempts to understand the characteristics and perspectives of those engaged in education research in UK universities. The HE Education Research Survey gathered information from over 1500 respondents about their experiences and perceptions to provide robust and rich data about the state of education as an academic discipline. In this session we present findings on the following key areas: the demographic characteristics of education researchers in the UK; participants' research areas, interests and aspirations; views on their institution, workload and conditions; methodological approaches; and engagement with networks and subject associations. These analyses are also complemented with the presentation of data and findings from the open response items in the survey which encouraged participants to share their views on current debates such as cultures of performativity, 'what works' research, the research impact agenda and to describe what it is like to be an education researcher in HE today.

Session T 3

26 August 2023 14:45 - 16:15
UOM_CH
Symposium
Teaching and Teacher Education

Promoting Self-Regulated Learning: The Effect of Teachers' Competences and Teaching Practices

Keywords: Competencies, Conceptual Change, Example-based Learning, In-service Teachers, Learning Strategies, Metacognition, Motivation, Secondary Education, Self-regulated Learning and Behaviour, Teacher Professional Development, Teaching/Instructional Strategies
Interest group: SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Johannes Jud, University of Zurich, Switzerland
Discussant: Franziska Perels, Saarland University, Germany

Competencies in self-regulated learning (SRL) are crucial for successful learning and thriving in life. In the past, research proposed many theoretical frameworks and findings on why teachers do or do not promote SRL and what impact teaching practices have on the development of students' competencies in SRL. However, there is still a lack of empirical evidence for the complexity of this educational process including many variables. Therefore, the contributions of the present symposium draw attention to different aspects and levels within the process of promoting SRL. This includes analyses of various teacher competences in promoting SRL, the effects of different ways to promote SRL and teacher-student relations. The first contribution investigates how pre-service teachers' own competences in SRL can be trained, conducting an experiment using modelling videos. The second contribution analyzes the effects of a two-year in-service teacher training program on various teachers' competences and their teaching practices. In the third contribution, a quasi-experimental study was conducted to investigate the effects of different ways how teachers promote their students' capability to transfer metacognitive learning strategies to various learning contexts. The final contribution analyzes the relation between teachers' motivation, their promotion of SRL and effects thereof on students' motivation to apply learning strategies. The results highlight the theoretical and practical importance of focusing on different teacher competences, stages of teacher training and a holistic way of promoting SRL. They contribute to the validation of theoretical concepts and reveal insights on how to best support teachers in promoting SRL.

Using video-based modelling examples to foster pre-service teachers' SRL competences
Presenting Author: Antonia Fischer, Institute for School Development Research, TU Dortmund University, Germany; **Co-Author:**Charlotte Dignath, TU Dortmund University, Germany

Self-regulation of learning (SRL) is an important skill for both learners and teachers. During their studies, prospective teachers are learners themselves. Developing SRL skills during their education seems to be an important goal for future teachers, but also for university students in general. To this end, we aimed at fostering teacher students' SRL by showing short instructional videos using modelling examples of SRL. We conducted an experiment with a pre-, post- and follow-up design and three groups (mastery group, coping group and active control group). $N = 157$ university students answered questionnaires about their SRL competences and then proceeded to work on a complex problem-solving task that assessed their SRL strategy usage by other means than self-report questionnaires and provided a measure for performance. Afterwards, participants watched one of three intervention videos, again filled out questionnaires and worked on another complex problem-solving task as part of the posttest. After four weeks, participants filled out an online questionnaire ($N_{follow\text{-}up} = 137$) as a follow-up measure. Preliminary results indicate that participants' beliefs (namely, their utility beliefs and beliefs inconsistent with SRL theory) and own SRL usage can be fostered by watching the modelling videos. Further analyses will be conducted after the coding of the remaining data and will be available at the conference. Fostering university (and teacher) students' SRL competences with instructional videos seems to be a worthwhile venture for some SRL competences. The follow-up results indicate that some students need additional support to avoid the development of inconsistent beliefs about SRL.

The impact of an in-service teacher professionalization on teachers' SRL competences
Presenting Author: Lies Backers, Ghent University, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium

Teachers play a key role in supporting students with self-regulated learning (SRL) at all school levels. Yet previous research shows that teachers, like students, struggle with SRL and SRL implementation. To support school leaders and their team of teachers to implement SRL, a two-year school-wide professionalization program was designed. This study focuses on the evolution of primary and secondary school teachers' SRL competences (i.e., teachers' content and pedagogical content knowledge, teacher consistent and inconsistent beliefs with SRL theory, teacher self-efficacy to implement SRL, and SRL promotion in class) after a year of participation in the professionalization. Respectively 201 and 330 primary and secondary school teachers completed self-report questionnaires to study their SRL competences. The intervention is currently ongoing. After the post-test (planned in April 2023) ANOVA will be used to analyze differences between pre- and posttest. The presentation will present detailed results as well as implications for practice and further research.

Teachers' direct and indirect promotion of self-regulated learning in secondary school
Presenting Author: Joachim Wirth, Ruhr-University Bochum, Germany; **Co-Author:**Xenia-Lea Weber, Ruhr-University Bochum, Germany; **Co-Author:**Jens Fleischer, Ruhr-University Bochum, Germany; **Co-Author:**Ferdinand Stebner, University of Osnabrück, Germany; **Co-Author:**Corinna Schuster, Ruhr University Bochum, Germany; **Co-Author:**Detlev Leutner, University of Duisburg-Essen, Germany

Various studies have demonstrated positive effects of direct training on metacognitive learning strategies. In direct training, teachers impart metacognitive

learning strategies explicitly, and research shows that students are able to apply those strategies after direct training to deal with learning tasks that are structurally similar to training tasks (near transfer), however, only to a very small extent. Furthermore, students rather fail in applying metacognitive learning strategies for dealing with structurally dissimilar learning tasks (far transfer). Indirect training following direct training could be an option to foster even far transfer of metacognitive learning strategies. In indirect training, teachers enrich a learning environment that is structurally dissimilar to the direct training environment with triggers that prompt students to transfer the acquired metacognitive learning strategies. This may promote far transfer. In a cluster-randomized controlled study with a total of 459 fifth and sixth-grade students, two interventions—direct and indirect training combined (EG1) and direct training only (EG2)—were compared with an untreated control group (CG). Repeated measure analyses of variance show that compared to CG, EG1 and EG2 showed stronger effects in terms of metacognitive learning strategies application in near transfer tasks. The descriptive superiority of EG1 over EG2 was not statistically significant. The preliminary results of the study cannot be considered as clear evidence for the positive effect of combining direct and indirect training to promote the transfer of metacognitive learning strategies in self-regulated learning.

Teachers' motivation for self-regulated learning: Relations to students' motivation
Presenting Author: Johannes Jud, University of Zurich, Switzerland; **Co-Author:**Yves Karlen, University of Zurich, Switzerland; **Co-Author:**Carmen Nadja Hirt, University of Zurich, Switzerland

The use of learning strategies is crucial for successful self-regulated learning (SRL). As the application of learning strategies can be effortful and frustrating, students' motivation for using learning strategies is important. Research highlights the relations between students' motivation and their use of learning strategies. Theoretical frameworks of teachers' professional competences for SRL and Expectancy-Value Theory (EVT) assume that students' motivation can be influenced by teachers' motivation and their promotion of SRL. However, empirical evidence in how far teachers' motivation for SRL and their promotion relate to students' motivation to use learning strategies is absent. Using a multilevel approach, this study investigates the relations between teachers' self-efficacy and attainment value in promoting SRL, their reported promotion of SRL (1) and the effect thereof on various students' motivational constructs (e.g. self-efficacy, utility value, costs) for SRL. Based on a sample of $N_{teachers}$ = 167 and their students (N = 2757) from 17 Swiss lower secondary schools, a multilevel analysis revealed positive and significant relations between teachers' motivation and their promotion. Further, the promotion was positively and significantly related to students' values for applying SRL strategies. No effect could be found for the cost facet. The results confirm theoretical assumptions and therefore highlight the importance of teachers' motivation and the promotion in the development of students' competencies in SRL.

Session T 4

26 August 2023 14:45 - 16:15
AUTH_DC1
Symposium
Instructional Design

How to optimize metacognitive monitoring and judgment accuracy

Keywords: Comprehension of Text and Graphics, Emotion and Affect, Example-based Learning, Instructional Design, Metacognition, Motivation, Pre-service Teachers, Quantitative Methods, Self-regulated Learning and Behaviour
Interest group: SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Rebecca Krebs, Ruhr-University Bochum, Germany
Chairperson: Linda Froese, Ruhr University Bochum, Germany
Organiser: Rebecca Krebs, Ruhr-University Bochum, Germany
Organiser: Linda Froese, Ruhr University Bochum, Germany
Discussant: Lucia Mason, University of Padova, Italy

Monitoring one's thoughts, actions and emotions as well as the quality of one' products during learning is essential for effective self-regulation. How learners can be effectively supported in these metacognitive monitoring processes, however, is in large parts still an open question. The present symposium is designed to address this question. Contribution 1 investigates the effects of a self-talk monitoring tool on preservice teachers' study performance as well as motivation and emotions towards learning. Contribution 2 deals with optimizing monitoring through the diagram completion task. The authors analyze whether prompting learners to self-assess diagrams that they completed after reading expository texts has added value to only completing diagrams regarding the accuracy of learners' judgments of learning. In Contribution 3, metacognitive monitoring in example generation tasks is supported through the provision of external standards. The authors investigate whether providing expert example standards in combination with focused processing prompts fosters judgment accuracy in evaluating the quality of self-generated examples for previously encountered new principles and concepts. Finally, Contribution 4 delves into supporting metacognitive monitoring and regulation through the provision of rubrics. With the help of think-aloud data, the authors aim to understand how rubrics beneficially affect judgment accuracy and regulation decisions in academic writing. In view of the experimental design and the different perspectives of the four contributions, the symposium will likely fruitfully extend our understanding of how learners can be effectively supported in metacognitive monitoring.

Can students monitor motivational and emotional strategies through self-talk? An intervention study.
Presenting Author: Alazne Fernández Ortube, University of Deusto, Spain; **Co-Author:**Ernesto Panadero, Universidad Deusto, Spain; **Co-Author:**Charlotte Dignath, German Institute for International Educational Research (DIPF), Germany; **Co-Author:**Lucía Barrenetxea-Mínguez, University of Deusto, Spain; **Co-Author:**Jesús Marauri, Universidad de Deusto, Spain

Zimmerman's (2000) definition of Self-regulated learning (SRL) states that for learners to be good self-regulators of their learning process they must monitor their thoughts, actions and emotions, reflect about them and adjust them to the context. Especially when talking about emotions, this intentional self-awareness is a difficult process, as it answers to environmental and personal factors that may not be controlled easily (Usher & Schunk, 2018). However, the capability of reacting to these factors can be trained. Our research presents an intervention study, which aims to explore whether the control of self-talk helps pre-service teachers improve their motivation and emotions towards learning. For this exploration, we have developed a quasi-experimental longitudinal study, with repeated measure design. We measure SRL skills, emotion, motivation and SRL knowledge. The convenience sample of this study consists of 61 first year pre-service teachers. At this point we have results from the pre-test and the first self-talk monitoring tasks. This data reflects that many participants report to have negative emotions towards learning. Self-efficacy beliefs for learning are rated the lowest, similar to beliefs about social learning. This relates with the data we have about SRL knowledge, where none of the participants mentioned emotions and social interaction as being part of SRL. We hypothesize that SRL skills, emotion, motivation and SRL knowledge will improve during the academic year, as for the moment we can observe a rise in self-monitoring tasks results.

Self-assessment of diagrams to increase monitoring accuracy in reading comprehension
Presenting Author:Héctor J. Pijeira-Díaz, Maastricht University, Netherlands; **Co-Author:**Janneke van de Pol, Utrecht University, Netherlands; **Co-Author:**Faisal Rehman Channa, University of Jyväskylä, Finland; **Co-Author:**Anique de Bruin, Maastricht University, Netherlands

The accuracy of students' monitoring of reading comprehension is often low. This has been explained by students' utilization of cues that are not diagnostic or predictive of their actual comprehension when making the judgments. Generative interventions such as completing diagrams about texts that students read have been effective in providing students with more diagnostic cues and fostering monitoring accuracy, but there is margin for improvement. We test whether asking students to self-assess their own diagrams increases the utilization of diagnostic cues, thereby improving monitoring accuracy of their text comprehension. Participants (N = 427 secondary school students) were randomly assigned to one of three conditions after reading, namely 1) only diagram completion, 2) diagram completion plus diagram self-assessment, or a 3) picture-matching filler task (control). In both diagramming conditions, monitoring accuracy was significantly higher than in the control condition (i.e., replication of the diagramming effect), but self-assessing the diagrams did not significantly increase either monitoring accuracy or cue utilization. Future attempts at improving monitoring accuracy with diagrams could look, for example, at the effect of providing students with real-time automated feedback on their diagram answers.

How to enhance learners' accuracy in evaluating self-generated examples?
Presenting Author: Linda Froese, Ruhr University Bochum, Germany; **Co-Author:**Julian Roelle, Ruhr University Bochum, Germany

In acquiring declarative knowledge, generating own examples can serve as a beneficial learning activity. As external feedback is rarely provided, learners frequently have to evaluate the quality of their self-generated examples on their own in order to make appropriate decisions concerning the further learning process. Unfortunately, previous research indicates that learners' ability to accurately judge the quality of their examples is poor. The provision of expert example standards has shown to foster learners' judgment accuracy in evaluating self-generated examples, however, learners were still largely inaccurate, which could be explained by the fact that learners did not engage in deep processing of the provided standards. One means to foster the processing of expert example standards could be prompting learners to highlight where in the expert examples the idea units of the respective content are illustrated as well to highlight these idea units in their self-generated examples as well. To test this assumption, in an experiment that followed a 2×2 factorial between-subjects design we varied whether university students were provided with expert example standards (with vs. without) and highlighting prompts (with vs. without) in evaluating the quality of self-generated examples. Preliminary results with $N = 77$ university students indicate that both expert examples and highlighting prompts can increase learners' judgment accuracy. Final results will be presented at the conference.

How to foster self-assessment accuracy and regulation through rubrics
Presenting Author: Rebecca Krebs, Ruhr-University Bochum, Germany; **Co-Author:**Julia Waldeyer, Ruhr-University Bochum, Germany; **Co-Author:**Björn Rothstein, Ruhr University Bochum, Germany; **Co-Author:**Julian Roelle, Ruhr University Bochum, Germany

Rubrics, which inform learners about assessment criteria for a task assignment and illustrate different levels of task performance, foster task performance. These beneficial effects are often attributed to effects of rubrics on self-assessment accuracy, which, in turn, would pave the way for effective regulation. However, research that explicitly tests this theoretically assumed mechanism is scarce. Against this background, in the present study we analyzed the effects of rubrics on (a) self-assessment and (b) regulation. $N = 243$ students received a brief introduction into the writing of abstracts for scientific articles, read a scientific article and wrote an abstract themselves. They then were asked to evaluate their abstract. Using a 2×2 factorial design, we varied whether the participants were guided by a rubric during the self-assessment (with or without) and during the revision phase (with or without). We assessed think-aloud protocols to determine which cues the participants used to assess themselves and make their regulation decisions. The data collection is not yet finished but full results will be available at the conference.

Session T 5

26 August 2023 14:45 - 16:15
UOM_A03
Symposium
Learning and Social Interaction

Stereotypes and Stereotype Threat in the Classroom: Effects and Interventions

Keywords: Achievement, Anxiety and Stress, Cultural Diversity in School, Gender Issues, Migrant / Refugee and Minority students, Self-efficacy, Social Aspects of Learning and Teaching, Social Interaction
Interest group: SIG 10 - Social Interaction in Learning and Instruction
Chairperson: Cristina Stringher, Istituto Nazionale per la Valutazione del Sistema Educativo di Istruzione e di Formazione (INVALSI), Italy
Chairperson: Justine Stang-Rabrig, TU Dortmund University, Germany
Chairperson: Nele McElvany, TU Dortmund University, Germany
Organiser: Justine Stang-Rabrig, TU Dortmund University, Germany
Discussant: Justine Stang-Rabrig, TU Dortmund University, Germany

Today's students grow up in heterogeneous classrooms. Heterogeneity-generating factors are, for example, gender, culture, and language. Although school contexts are characterized by diversity, stereotypes and stereotype threat (S/ST) are still existent and effects can be manifold. Besides effects on achievement, S/ST can impact motivation, learning, stress response, and social relationships. Thus, among other factors, S/ST contribute to the explanation of educational inequalities. Therefore, this symposium combines current cutting-edge research on central effects of S/ST and the effectiveness of interventions to reduce them. The first presentation investigates effects of stereotype awareness and beliefs on fifth-grade girls and boys math test anxiety and self-efficacy. The second focuses on ST effects on vocabulary learning and stress response in ninth-grade language-minority students and important moderators. The third presentation analyzes how social identity threat contributes to ninth-grade ethnic-minority students' reduced motivation to establish and maintain peer relationships. The last one focuses on immigrant-minority youth students and presents two studies on ST effects on performance and one intervention study to reduce threat. The symposium presents central lines of current S/ST research from different countries and disciplines. Findings approve existing results and go beyond by revealing vital new insights. Against the background of heterogeneous classrooms, it is more important than ever to further investigate S/ST effects on students' educational success and intervention possibilities to reduce educational inequalities. Based on results, relevant implications for research and educational practice can be deduced. The concluding overall discussion allows for an overarching, critical synopsis with appreciation of the individual results.

How stereotype awareness and stereotype belief impact test anxiety and self-efficacy in math
Presenting Author: Nadia Leroy, Université Grenoble Alpes, France; **Co-Author:**Sylvain Max, Burgundy School of Business, France; **Co-Author:**Pascal Pansu, Université Grenoble Alpes, France

The idea that people do not need to believe in a stereotype for them to be victims of it appeared in the early literature about stereotype threat. Since then, many stereotype threat studies have focused on the distinction between stereotype awareness and stereotype belief. This study examines the role of stereotype awareness and stereotype belief in test anxiety and self-efficacy in mathematics. 600 students in 5th grade participated in the study. At the beginning of the school year, they were asked to give their opinion about 2 stereotype awareness items concerning gender performance in math (people think that girls/boys are good/bad at math), and 2 stereotype belief items concerning gender performance in math (I believe that girls/boys are good/bad at math). In the middle of the school year, we measured the participants' test anxiety and self-efficacy. The data were analyzed using a polynomial regression and response surface analysis. The results showed that when girls are strongly aware of the negative stereotype concerning them, and they believe in it, they experience greater test anxiety. For boys, when they are strongly aware of the negative stereotype concerning girls, and they believe in it, they demonstrate greater self-efficacy. By showing the non-linear relationship between awareness/belief and test anxiety/self-efficacy, our results provide a useful insight into how the gender stereotype affects math performance at junior high school. In conclusion, both awareness and belief appear to influence the effects of stereotype threat in that the emotional response and cognitive response are heightened by them.

Stereotype Threat Effects on Vocabulary Learning and Stress Response
Presenting Author: Justine Stang-Rabrig, TU Dortmund University, Germany; **Co-Author:**Sabrina König, TU Dortmund University, Germany; **Co-Author:**Oliver Wolf, Ruhr University Bochum, Bochum, Germany; **Co-Author:**Nele McElvany, TU Dortmund University, Germany

Classrooms in Germany are culturally and linguistically diverse. Large-scale assessments showed on average achievement disparities between language minority and majority students in different domains. One possible explanation for achievement-related differences are stereotype threat (ST) effects. Whether ST impacts minority students' vocabulary learning in the language of instruction, which is key to academic success, as well as their stress response is unclear. Moreover, the role of central personal and contextual mediators and moderators in learning situations is not yet resolved. Based on 200 ninth grade language minority students ($M_{age} = 14.99$, $SD = 0.87$; 49.0% female, 2.0% diverse), we analyzed whether ST affects vocabulary learning and change in two important physiological stress markers (salivary alpha-amylase, cortisol). Furthermore, stress was investigated as mediator, school type (comprehensive/grammar school) and identification with school as moderators of ST effects. Students participated in a pre-post vocabulary learning design within their classrooms with salivary

sampling. They were randomly assigned to one of four experimental conditions (implicit, explicit without and with threat removal before vocabulary posttest, control group). Repeated measures analyses of (co)variance revealed no statistically significant ST effects on vocabulary learning and change in cortisol, but a statistically significant increase in alpha-amylase values from t1 to t2 as well as an interaction between experimental condition and change in alpha-amylase. Neither school type nor identification with school severed as moderators. Results are discussed in terms of content and methodological issues. Implications for further research are derived.

Social Identity Threat is Related to Ethnic Minority Adolescents' Social Approach Motivation
Presenting Author: Laura Froehlich, FernUniversität in Hagen, Germany; **Co-Author:**Nathalie Bick, FernUniversität in Hagen, Germany; **Co-Author:**Jana Nikitin, University of Vienna, Austria; **Co-Author:**Sarah E. Martiny, UiT The Arctic University of Norway, Norway

The current research investigated the relation of social identity threat and social approach motivation for ethnic minority adolescents. In a sample of 426 ethnic minority students from 36 9th-grade classes in Germany, we found a negative indirect effect of social identity threat on social approach motivation via reduced sense of belonging to the classroom. The interplay of students' ethnic and national identity moderated the relationship of social identity threat and sense of belonging. The relationship was particularly negative for students who only endorsed either ethnic or national identity strongly. However, it was less pronounced for students with integrated multiple social identities (i.e., high endorsement of ethnic and national identity) and non-significant for students who identified neither with the ethnic nor the national group. Results generalized for social approach motivation towards ethnic majority students and ethnic minority students in the classroom. Moreover, these patterns were only found for social approach motivation in face-to-face contact situations, but not in online situations. Findings are discussed in light of the literature on social identity threat and multiple social identities, address limitations, and point to future research directions.

CANCELLED: How does stereotype threat work and how to buffer its effects on minority achievement?
Presenting Author: Karen PHALET, KU LEUVEN, Belgium; **Co-Author:**Gülseli Baysu, Queen's University Belfast, United Kingdom

Taking a social identity approach to stereotype threat in the classroom, we conducted 2 field experiments. Firstly, we established stereotype threat processes in the classroom, so that immigrant minority youth in Flanders underperformed on an inductive reasoning task in the experimental threat condition (when their minority identity was made salient immediately preceding the performance task) through disengagement with learning (relative to a control condition (when questions about their minority identity were asked after completing the performance test). Moreover, we found evidence for protective effects of shared non-discrimination norms in the school environment, so that effects of stereotype threat were not significant in non-discriminatory school contexts. Secondly, we piloted a novel field intervention to reduce identity threat in the classroom (through affirming the dual identities of minority students). Our findings partially confirmed our hypothesis, so that Black students were performing better in the dual identity (vs individual) affirmation condition through reduced threat, yet individual self-affirmation worked better for Asian students. We will discuss future directions and applied implications for creating inclusive learning environments.

Session T 6

26 August 2023 14:45 - 16:15
UOM_A02
Symposium
Learning and Social Interaction, Learning and Special Education

Family-based Interventions: Increasing Developmental and Educational Chances of Children At-risk?

Keywords: At-risk Students, Early Childhood Education, Learning and Developmental Difficulties, Parental Involvement in Learning, Parents' Beliefs and Affect, Quantitative Methods, Social Aspects of Learning and Teaching, Social Sciences and Humanities, Special Education
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 15 - Special Educational Needs
Chairperson: Isabelle Kalkusch, Switzerland
Organiser: Isabelle Kalkusch, Switzerland
Discussant: Minna Törmänen, Switzerland

In the early years the home environment and family–child interactions are the main engine for a child's development (Bronfenbrenner & Morris, 2006), with transition to formal education additional contexts become relevant. For children growing up in families affected by psychosocial risk factors (e.g., social isolation, poverty, or mental illness) as well as children with special needs it might be crucial for their positive development to support their early learning environment. This symposium explores different ways in which children at-risk for developmental problems can be supported in the longer term and in a sustainable way by family-based interventions.
One pathway is using family-based interventions, which aim amongst others at promoting parental sensitivity and positive parenting practice as early as possible in preventive manner. Such interventions are indicated as having a positive short-term effect for several developmental child characteristics (Jeong et al., 2021). However, so far there is few empirical evidence regarding long-term effects. The first and second contribution both investigate the effects of early family-based interventions in the primary school-age using RCTs with a longitudinal design. The third and fourth contribution examine different intervention approaches which take place at a later stage and focus on both the family and the formal education. The symposium provides important indications on how children who are disadvantaged in their developmental chances due to various reasons can be supported throughout their early years by strengthening the family as a resource.

Effects of two staffing models in the home visiting program Pro Kind at age 7
Presenting Author: Marie Lisanne Schepan, Leibniz-Institute for Prevention Research and Epidemiology - BIPS, Germany; **Co-Author:**Malte Sandner, Technical University Nuernberg, Germany; **Co-Author:**Sören Kliem, Department of Social Work, University of Applied Sciences Jena, Germany; **Co-Author:**Tilman Brand, Leibniz Institute for Prevention Research and Epidemiology – BIPS, Germany

Exposures and experiences during pregnancy and the first years can have long-lasting effects on developmental trajectories over the life-course. In this study we analyzed the long-term effects of the home visiting program Pro Kind comparing two staffing models. In this program, low-income first-time mothers were visited either by a midwife (midwife-only model) or a midwife-social worker team (tandem model). The home visits started during pregnancy and lasted to the child's second birthday. The results of a randomized trial at child age 7 showed beneficial effects on children's behavioral problems in both groups. Furthermore, positive effects were found on abusive parenting, parenting stress and maternal mental health in the midwife-only group. In conclusion, this study shows that early interventions can have positive effects on children and parents that can still be detected five years after the end of the intervention.

Early Childhood Family-Based Intervention: Effects on School Relevant Outcomes in Primary School?
Presenting Author: Isabelle Kalkusch, University of Teacher Education of Special Needs, Switzerland; **Co-Author:**Alex Neuhauser, University of Applied Sciences of Special Needs Education, Switzerland; **Co-Author:**Patsawee Rodcharoen, University of Teacher Education in Special Needs Zurich, Switzerland, Switzerland; **Co-Author:**Simone Schaub, University of Teacher Education in Special Needs, Switzerland; **Co-Author:**Minna Törmänen, University of Teacher Education in Special Needs Zurich, Switzerland; University of Helsinki, Finland, Switzerland; **Co-Author:**Erich Ramseier, Bern University of Teacher Education (i. R.), Switzerland; **Co-Author:**Andrea Lanfranchi, University of Applied Sciences of Special Needs Education, Switzerland

Children's early childhood experiences are crucial for their positive development. A high level of familial stress is a risk for children's development – especially children from psychosocially burdened families might experience a high stress level. This study investigates the effectiveness of a family-based early childhood program on school relevant outcomes in primary school-age. The longitudinal RCT study ZEPPELIN examines the effectiveness of the «Parents as Teachers (PAT)» program with families with at least two present risk factors. The final sample were 248 families, who were randomly allocated to an intervention (IG, n = 132 families) and a control group (CG, n = 116 families). Former cross-sectional results showed mainly positive effects on children's language skills, problem behavior and self-regulation. At age 7 an effect was found on children's behavior problems regarding hyperactivity only, preliminary additional analyses showed weak indirect effects on school achievement. For the presentation results on children's school relevant outcomes at age 9 will be included. The investigation of the effectiveness of early intervention programs in school age is a meaningful step to develop sustainable promotion approaches for children with psychosocial

stress.

Reducing behavioral problems: A family and school-based intervention
Presenting Author: Markus Neuenschwander, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland; **Co-Author:**Ilona Rösti, University of Applied Sciences and Arts Northwestern Switzerland FHNW, Switzerland; **Co-Author:**Vanessa Prieth, University of Applied Sciences and Arts Northwestern Switzerland FHNW, Switzerland; **Co-Author:**Alafia Zavery, University of Applied Sciences and Arts Northwestern Switzerland FHNW, Switzerland

Behavioral problems in elementary school are a risk factor in children's' school career, that challenges parents and teachers and is related to adolescents' drug abuse. Strategies to reduce problem behavior include improving parents' empathy to appropriately react to the child's needs, supporting child's socio-emotional learning and enriching teachers' practices to handle disruptive behavior in the classroom. A combined intervention with a family program and a teacher program was developed to reduce reactive and proactive aggression of children at risk in kindergarten and elementary school. The effectiveness of the intervention was tested using a randomized pretest-posttest design. A total of 158 children from kindergarten and elementary school participated in this study, 117 children were in the experimental group and 41 children in the control group. In sum, 232 Teachers and 124 parents filled out standardized questionnaires. A test was applied to measure children's emotion recognition. The results show that the intervention increased the parents' empathy toward their child and increased the child's emotion recognition. It increased the extent that the teachers structure their classroom and that teachers react to disruptive behavior in classroom. An in-depth analysis with teachers who applied 7 out of 8 core elements of the intervention showed that the intervention significantly reduced children's reactive and proactive aggression. The family program allowed to support parents at risk who are reluctant to participate in school programs. An innovative combined intervention presents an approach to coordinate interventions in family and school to reduce behavior problems of children at risk.

Parental involvement interventions for children with special educational needs: A systematic review
Presenting Author: Hannah Hamid, UCL- Institute of Education, United Kingdom; **Co-Author:**Zachary Walker, UCL- Institute of Education, United Kingdom; **Co-Author:**Jo Van Herwegen, UCL Institute of Education, United Kingdom

Research literature continues to support the idea that parental involvement and engagement in their children's education and meaningful school partnerships are an important contributor to a child's educational outcomes (Epstein, 1991; Goodall & Montgomery, 2014). This study systematically reviewed research that has examined the impact of parental involvement interventions for parents of children with special educational needs (SEN) and highlights the quality and potential gaps in research.
The population for this review focused on parental involvement interventions for parents of children with SEN aged 4-18. All interventions for parental involvement for parents of children with SEN were included. This included both individual and group-based interventions based in any setting and delivered in any manner. The review also included studies with qualitative, quantitative, and mixed research designs and those that may or may not have included a control group. Studies that conducted interventions that impacted academic, behavioural and wellbeing outcomes for children with SEN were also included. Both published literature and grey literature were searched. We found *n=14* studies that conducted parental involvement interventions for parents of children with special educational needs. Training interventions (*n=12*) were the primary intervention type utilized, with behavioral and academic outcomes being the focus of most interventions (*n=12*). Findings highlighted that the parental involvement interventions had a positive impact on child related outcomes. Future research needs to consider wellbeing outcome measures, follow up assessments, and sample size. Findings from this review will inform a future intervention for parental involvement for parents of children with SEN.

Session T 7

26 August 2023 14:45 - 16:15
AUTH_T102
Single Paper
Instructional Design, Learning and Instructional Technology

Video-based Learning

Keywords: Cognitive Skills and Processes, Computer-assisted Learning, E-learning/ Online Learning, Eye Tracking, Higher Education, Instructional Design, Pre-service Teachers, Social Aspects of Learning and Teaching, Video-based Learning
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 12 - Writing, SIG 27 - Online Measures of Learning Processes
Chairperson: Charalambos Charalambous, University of Cyprus, Cyprus

Cognitive and Attentive Measures of Intra-individual Variability in Video-based Learning
Keywords: Cognitive Skills and Processes, E-learning/ Online Learning, Eye Tracking, Higher Education
Presenting Author: Kshitij Sharma, Norwegian University of Science and Technology (NTNU), Norway

Eye-tracking provides unprecedented access to students' attention and cognitive workload. Situated within video-based learning, there are moments when students face attention lapse and variations in cognitive load. The main reasons are prior knowledge, or lack thereof, and variation in the difficulty of the content. In this contribution, I present an analysis of two different constructs: cognitive workload (measured by pupil-diameter) and with-me-ness (students' attentional response to the deictic gestures and dialogue of the teacher) to show the intra-student variance during a video-lecture. I will also compare these variances with the student performance to show how these intra-student variances are related to their post-lecture performance. I will use a context-dependent unit of time, that is, the concept that the teacher presents. I will use a programming lecture, where the teacher presents both the theoretical and practical aspects of a programming concept (i.e., tail-recursion). These two aspects of the lecture will function as the two different time units for the analysis. The results show that students with high performance are "with the teacher" during both theoretical and practical parts of the video-lecture, while students with low performance are "with the teacher" during the theoretical aspects of the lecture but not during the practical aspects. The cognitive load is similar for high-performing students in the two parts. Whereas students with low performance have a higher cognitive load during practical parts of the lecture than the theoretical parts. I will discuss how these results can inform the design of student scaffolding tools.

Social Cues in Educational Videos – The Importance of Moderating Variables
Keywords: E-learning/ Online Learning, Instructional Design, Social Aspects of Learning and Teaching, Video-based Learning
Presenting Author: Maik Beege, University of Education Freiburg, Germany

Educational videos offer various possibilities to include multimodal social cues. Nevertheless, it is still unclear if social cues in videos are beneficial or detrimental for learning and if so, which processes are responsible for the effect. Within this contribution, general theoretical assumptions are presented and implications for educational video design are derived. Relying on this theoretical basis, two experiments are presented that deal with the influence of social cues on different learning processes. In the first experiment the use of gestures performed by a video instructor was investigated. Results revealed that the use of gestures did not foster learning in general. In line with the signaling principle, only the use of deictic gestures was found to be beneficial for learning. In the second experiment, model-observer similarity and emotional design of pedagogical agents regarding gender were investigated. Results revealed that that gender similarity between the agent and the learner was not generally beneficial for learning. Moreover, model-observer similarity was only beneficial when additional enthusiastic cues were performed. Results show that the effects of social cues on learning seem to depend on moderating variables. Consequently, the role of social cues in dynamic learning material should be further discussed and investigated.

Do learners' benefit when taking notes from instructional videos and if how?
Keywords: E-learning/ Online Learning, Higher Education, Instructional Design, Pre-service Teachers
Presenting Author: Anke Wischgoll, TU Dortmund University, Germany; **Co-Author:**Monika Post, TU Dortmund University, Germany

Note-taking is a learning activity practiced condensing information from lectures, texts, and videos. Instructional videos have become more and more common for learning purposes in pre-service teacher education in recent years. However, learners' notes are often incomplete and lack focus on relevant information.

Focusing attention to relevant information by providing prompts for note-taking might be a suitable means to foster learners' engagement with relevant information. The aim of the study was to find out how learners might benefit from instructional videos by note-taking, more specifically, whether they benefit from prompted note-taking to increase their learning gains. Therefore, we conducted an intervention study with 183 pre-service math teachers that included three conditions: All groups observed two instructional videos: one on the concept of conditional probability (i.e., part-whole relationship) and one on how to explain it to students (i.e., meaning related-language). In addition, the note-taking group was asked to take notes on important information, whereas the prompted note-taking group was asked to take notes on part-whole relationship and meaning-related language. The control group did not receive an additional treatment. All participants were asked to apply the information provided in the instructional videos in two practicing tasks. Prior knowledge and learning outcome such as use of meaning-related language were measured by specifically developed items. Our results showed that the prompted note-taking group outperformed the note-taking group significantly. However, no statistically significant differences could be found between the control group which did not take notes and the prompted note-taking group.

Prompts and Engagement during an Online Video Lecture: An Experimental Field Study
Keywords: Computer-assisted Learning, E-learning/ Online Learning, Higher Education, Video-based Learning
Presenting Author: Markus H. Hefter, Bielefeld University, Germany; **Co-Author:**Veit Kubik, University of Würzburg, Germany; **Co-Author:**Kirsten Berthold, University of Bielefeld, Germany

During the recent COVID-19 lockdown measures, many university lecturers sought an effective and viable way to transform their lecture material into asynchronous online video lectures. Researchers have recommended implementing prompts to ensure that students process such video lectures adequately. However, as there are still open questions regarding the types of prompts and the role of students' engagement, we conducted an online field experiment with 124 teacher students (73 female, 49 male) in which we presented an online video lecture (on the topic "Cognitive Apprenticeship") supplemented by different kinds of prompts. We compared the following randomly assigned experimental conditions: (A) note prompts ($n = 31$), (B) principle-based self-explanation prompts ($n = 36$), (C) elaboration-based self-explanation prompts ($n = 29$), and (D) both principle- and elaboration-based prompts ($n = 28$). Our results revealed that the video lecture fostered declarative knowledge regardless of the type of prompt. The different prompt types in fact resulted in different types of self-explanations, but they had no statistically significant effect on learning outcomes. However, the students' self-explanation quality and their persistence (i.e., actual participation in a delayed posttest) were beneficial, whereas the number of interruptions was detrimental to the learning outcomes. Overall, our findings provide ecologically valid empirical support for how fruitful it is that students engage themselves in self-explaining and avoid interruptions when learning from asynchronous online video lectures.

Session T 8

26 August 2023 14:45 - 16:15
UOM_A06
Single Paper
Cognitive Science

Critical Thinking, Epistemic Beliefs and Knowledge Construction

Keywords: Argumentation, Assessment Methods, Attitudes and Beliefs, Critical Thinking, Digital Literacy and Learning, Knowledge Construction, Pandemic, Reasoning, Science and STEM
Interest group: SIG 03 - Conceptual Change, SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Vasilia Christidou, Aristotle University of Thessaloniki, Greece

The relative influence of epistemic aims and epistemic perspectives on reasoning processes
Keywords: Argumentation, Critical Thinking, Knowledge Construction, Reasoning
Presenting Author: Michael Weinstock, Ben-Gurion University of the Negev, Israel; **Co-Author:**Netta Le Guennec, Ben Gurion University of Negev, Israel

Chinn's AIR model of epistemic cognition specifies three components involved in thinking about aspects of knowledge: epistemic aims, epistemic ideals, and reliable processes. Epistemic aims concern the goals one sets in considering epistemic matters. Epistemic ideals are the criteria one uses to evaluate if epistemic aims have been met. Reliable processes are the strategies, procedures, and cognitive processes people use to successfully achieve their epistemic aims.The current research is to test the interaction between the components by seeing if reliable processes do vary depending on a given epistemic aim. The research also tested the relative contribution of epistemic aims on a reasoning task when compared with aspects of the epistemic perspectives model of epistemic thinking. This model posits three basic epistemic perspectives of absolutism, multiplism, and evaluativism. Evaluativism includes understanding that evidence and theory need to be separated and coordinated to construct and justify knowledge. This has been found to underlie sound reasoning processes. 55 Israeli adults heard a summary of a jury trial, including the judge's instructions. In one condition the judge explicitly emphasized the aim of comparing verdicts, and in the second condition, the judge emphasized the aim of evaluating testimony credibility. Participants explained their verdict choice, and different reasoning types were identified. The instructed aim had little effect on reasoning, but the aim used by the participants did have some effect. Notably, the participant's own aim was related to epistemic perspective. This, both models of epistemic cognition has some confirmation of their role in reasoning process.

Resolving Disagreements Between Experts through Identifying Questionable Research Practices
Keywords: Critical Thinking, Digital Literacy and Learning, Reasoning, Science and STEM
Presenting Author: Clark Chinn, Rutgers University, United States; **Co-Author:**Toshio Mochizuki, Senshu University, Japan; **Co-Author:**Hiroki Oura, Tokyo University of Science, Japan; **Co-Author:**Etsuji Yamaguchi, Kobe University, Japan

In the modern, digital world, citizens often face situations in which experts disagree. It is difficult, however, for laypeople to determine which experts to trust when the experts disagree. We considered two strategies laypeople might use to try to resolve such disagreements—(1) discovering that one expert has engaged in questionable research practices and discounting their work accordingly, and (2) considering the past track record of having engaged in such practices. Specifically, we asked: (1) Do undergraduates (as laypeople) take questionable research practices (specifically, misrepresenting others' findings) into account when they appraise the trustworthiness of experts and their claims? (2) If so, do they use information about an expert's negative track record (specifically, past misrepresentations) to downgrade the credibility of this expert when the expert makes claims about different topics in the future? We addressed these questions in a 2 x 2 factorial experiment with Japanese undergraduates in which participants read claims by two disagreeing educational experts. Expert A misrepresented the findings of Expert B's research, and in some conditions, Expert B called attention to the misrepresentation. In the results, when students saw Expert A's misrepresentations contradicted, they were less likely to trust Expert A's claims about this topic, and they were also less likely to trust this expert's claims on a second, unrelated topic. These findings suggest that one way to combat the rampant misrepresentations that occur online is to explicitly contradict them and to call out the perpetrators for their misrepresentations.

Epistemic Understanding as Basis for Evaluating Change in Scientific Conclusions Regarding COVID-19
Keywords: Critical Thinking, Knowledge Construction, Pandemic, Reasoning
Presenting Author: Michael Weinstock, Ben-Gurion University of the Negev, Israel; **Co-Author:**Sarit Barzilai, University of Haifa, Israel; **Co-Author:**Eva Thomm, University of Erfurt, Germany; **Co-Author:**Nadav Davidovitch, Ben-Gurion University of the Negev, Israel

During the COVID-19 pandemic, many scientific conclusions changed. The unusual public display of science in progress and concern for scientific conclusions makes the COVID pandemic a good context in which to examine whether epistemic understandings are related to how people reason with and about information in everyday contexts. This study, with 398 German and Israeli adults, examined whether epistemic understandings of scientific knowledge predicted evaluations of a change in conclusions about how COVID is transmitted when taking into consideration knowledge about COVID, familiarity with the topic of COVID transmission, and trust in COVID scientists. The epistemic understandings consisted of epistemic perspectives (absolutist, multiplist, and evaluativist), beliefs about the development and changeability of scientific knowledge, and sense of scientific knowledge as variable. Participants' evaluations of change in of the

COVID conclusion consisted of agreement with the new claim, correctness of the new claim, trustworthiness of the scientists who changed their minds, and whether the change represented a positive development in science. Epistemic perspectives, but not belief in development of scientific knowledge nor sense of science as variable, predicted evaluations of change in the COVID conclusion. Notably, evaluativism predicted trustworthiness of scientists who changed their minds and positivity of change. Trust in information provided by COVID scientists was also a major predictor, but epistemic perspectives predicted evaluations of change even when controlling for this. The findings suggest the importance of fostering epistemic growth and an understanding of how uncertainty and openness to change might represent strengths rather than weaknesses of science.

Factorial validity revised: The structure of epistemic beliefs and perspectives across instruments
Keywords: Assessment Methods, Attitudes and Beliefs, Critical Thinking, Knowledge Construction
Presenting Author: Martin Greisel, University of Augsburg, Germany; **Co-Author:**Ingo Kollar, University of Augsburg, Germany

There is a long-lasting discussion about the structure and interrelations of epistemic beliefs/dimensions and perspectives (absolutism, multiplism, and evaluativism), accompanied by a struggle with factorial validity of corresponding questionnaires. Therefore, this study examines different measurement instruments at different levels of specificity to investigate which facets emerge and whether they can be combined to broader dimensions and perspectives or not. In two studies, N=285 and N=254 pre-service teachers answered the Questionnaire for the Measurement of Epistemic Beliefs (FEE), the Topic-Specific Epistemic Beliefs Questionnaire (TSEBQ), and, in a topic- and situation-specific version, the Epistemic Thinking Assessment (ETA). We found that the expected factor structure could not be replicated, but more fine-grained facets emerged from different factor analyses. Especially certainty and justification seem to be further divisible into distinct dimensions. However, these facets were hardly interrelated as expected and did not always combine to broad dimensions or perspectives. Consequently, we propose that new instruments should be developed that assess the facets separately in a systematic manner. Cluster- or profile-based approaches might then try to identify common patterns of combinations (if they exist across populations and topics) to establish new conceptualizations of coherent epistemic stances beyond absolutism, multiplism, and evaluativism.

Session T 9

26 August 2023 14:45 - 16:15
UOM_R09
Single Paper
Lifelong Learning, Motivational, Social and Affective Processes, Teaching and Teacher Education

English as a Foreign Language

Keywords: Anxiety and Stress, Curriculum Development, Digital Literacy and Learning, Educational Policy, Educational Technologies, Emotion and Affect, Foreign and Second Language Acquisition, Lifelong Learning, Motivation, Teacher Effectiveness, Teacher Professional Development
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education
Chairperson: Jeroen Lavrijsen, KU LEUVEN, Belgium

Relationships between motivation and anxiety in adult EFL learners
Keywords: Anxiety and Stress, Emotion and Affect, Foreign and Second Language Acquisition, Motivation
Presenting Author: Merih Welay, University of Szeged, Hungary; **Co-Author:**Marianne Nikolov, University of Pécs, Hungary

The motivation and anxiety that comes with learning a new language have been linked in several studies conducted in a variety of educational contexts. Considering the importance and complexity of motivation and anxiety, this study seeks to investigate their connections in a setting where no similar investigation has before, taken place in this context. To accomplish this, we had to first validate the L2 motivational self-system (L2MSS) (Dornyei, 2005, 2009) and a new FL anxiety scale. This was done based on hypothesized relationships between the L2MSS (i.e., the ideal L2 self, ought to L2 self, and L2 learning experience), and FL anxiety (facilitative and debilitative). A total of 65 university students participated in the study. A questionnaire was used to collect the data. Descriptive statistics, correlation analysis, and t-tests in SPSS version 25 were used to analyze the data. The L2MSS and FL anxiety instruments had total scale reliability values that were greater than 0.6 (0.90 and 0.70, respectively), indicating that both constructs had adequate consistency. To evaluate the validity of the constructs, we employed several model fit indices, and they all showed that the models were valid. Student L2MSS and FL anxiety were rated as moderate. The ideal L2 self of students and their L2 learning experiences were shown to have the greatest significant association, whilst the latter was found to have a weak but significant relationship with debilitating anxiety. The report delves into these findings and their ramifications for the classroom and future study.

Primary school EFL teachers implementing an ambitious 21st century skills curriculum
Keywords: Curriculum Development, Educational Policy, Teacher Effectiveness, Teacher Professional Development
Presenting Author: Tony Burner, University of South-Eastern Norway, Norway

A new curriculum was introduced in Norway in 2020. The present study reports from an ongoing longitudinal evaluation project looking into how primary school teachers in different subjects are implementing the new curriculum. This presentation will focus on English as a foreign language teachers (EFL). Data at the first stage are collected through interviews and observations at four case schools. In the second stage questionnaires to a larger sample will be used. The findings indicate that the teachers are more focused on their subject, neglecting the general parts of the curriculum. A more student active role is present. Important elements of the curriculum are worked with, for example democracy and citizenship and health and life skills. However, some teachers feel alone, they miss spaces for collaboration due to the pandemic, they lack updated learning resources, and they lack sufficient time to work with the implementation of the new curriculum. There is also a need for a leadership that is "hands on".

Using educational technology in adult ESOL provision: a case study
Keywords: Digital Literacy and Learning, Educational Technologies, Foreign and Second Language Acquisition, Lifelong Learning
Presenting Author: Pirjo Mottus, University of Tartu, Estonia

The case study explored tutors' readiness to continue using educational technology once they return from the virtual to the face-to-face classroom. Specifically, the action research study examined tutors' attitudes towards incorporating technology into their practice and the enablers and barriers to that. The data collected through focus group interviews showed that tutors are motivated to continue integrating educational technology into their practice, following the Scottish adult learning strategy guidelines for using technology to enhance learning. Although tutors have acquired the necessary educational technology skills during the two years of online teaching, they need further structured training to adopt a more organised and purposeful approach to technology use. Also, learners' low digital skills hamper integrating technology into classroom practice.

Session T 10

26 August 2023 14:45 - 16:15
UOM_A05
Single Paper
Educational Policy and Systems, Higher Education, Lifelong Learning

Gender Issues in Higher Education and Lifelong Learning

Keywords: Attitudes and Beliefs, Competencies, Educational Policy, Gender Issues, Higher Education, Inclusive Education, Lifelong Learning, Qualitative Methods, Quantitative Methods
Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Tom Rosman, Germany

Entrepreneurship Education in Higher Education: Preliminary insights from the GUESSS survey
Keywords: Competencies, Educational Policy, Gender Issues, Higher Education
Presenting Author: Athanasia Loukidou, University of Macedonia, Greece; **Co-Author:**Stavroula Laspita, University of Western Macedonia, Greece; **Co-Author:**KATERINA SARRI, UNIVERSITY OF MACEDONIA, Greece

Several scholars support that entrepreneurship education (EE) is positively related with entrepreneurial intentions (EI); however, there are also studies indicating a negative or neutral relation between EI and EE. In this context, the Global University Entrepreneurial Students Spirit Survey (GUESS), a large research project taking place every two or three years since 2003, aims at exploring university students' views about entrepreneurship. Universities, comprising of both formal and informal learning contexts, can have differential effects on students' EI. On the one hand, the formal learning shapes the cognitive structures of potential entrepreneurs, while the informal context cultivates the entrepreneurial values and norms necessary for shaping a sustainable entrepreneurial climate. The aim of the current study is to enquire whether entrepreneurship education and the university climate enhance students' attitudes towards starting a new business. Additionally, the study focuses on gender differentiations, since previous research indicates that men seem to have greater EI than women, whereas the impact of EE on EI may not be as effective for men as for women. The data derive from the two latest GUESSS survey reports for the Greek Universities, carried in 2018 and 2021, which contain close-ended and open-ended questions. The findings reflect that both EE and the university climate have a positive impact on students' EI in the Greek University. Additionally, the gender gap is also evident.

The work of language. Explorations of institutional responses to diversity in Swedish universities.
Keywords: Educational Policy, Gender Issues, Higher Education, Inclusive Education
Presenting Author: Asia Della Rosa, Jönköping University, Sweden; **Co-Author:**Sangeeta Bagga-Gupta, Jönköping University, Sweden

This paper presents initial analysis of a study that aims to highlight the dynamics of power and (in)equality within Swedish academic spaces. Its point of departure is the growing "diversity" within Swedish academia in the 21st century, as evidenced through its increasing "internationalization". The policing of words like "race" (and other identity categories like functional disabilities) in both scholarly endeavors and in the popular imagination in the nation-state of Sweden are explored to highlight the work of language in equity related efforts that Higher Education, HE, is committed to. Aligning with a Second Wave of Southern Perspectives, SWaSP, this study draws attention to the continuing hegemonic *colonial*-order-of-things as the *naturalized*-order-of-things and builds on the entanglements of *two*broad strands of theorizing: sociocultural/adharanikaran/ubuntu perspectives and decolonial/southern thinking.Using a post-methodological gaze, we critically analyze HE web-pages and official documents related to increasing diversity and internationalization-oriented strategies, the promotion of equal opportunities and guidelines governing discrimination, that are published by the five largest universities in the nation-state of Sweden. Our preliminary findings draw attention to the work of language (and other semiotic resources) for understanding issues related to diversity, (inter)culturality and equal opportunities, but also the absence of words like race [*ras*] and racism in HE documents. These findings raise questions regarding the effectiveness of contemporary anti-discrimination policies. We argue that such tendencies need to be understood in light of a peculiar Swedish hegemonic "ISM's of oppression" based on whiteness and a continuing marginalization of the other.

Sexism in Higher Education: An experimental study to assess gender stereotypes using vignettes
Keywords: Attitudes and Beliefs, Gender Issues, Higher Education, Quantitative Methods
Presenting Author: Ana María Espinoza Catalán, Universidad de O'Higgins, Chile; **Co-Author:**Natalia Albornoz, Universidad de O'Higgins, Chile

Moving towards education with equity is an objective of education systems worldwide. However, in Chile, as in other countries, there are multiple manifestations of sexism in education, which undermine the learning and development of all students. Gender stereotypes is one of the most relevant psychosocial factors that explains gender gaps in education. Current study aims to assess gender stereotypes in education among undergraduate students. A 2x2x2 between-subjects experimental design with randomised vignettes was implemented. A sample of 297 students from different background degrees at a Chilean public university participated. Participants were randomly assigned to questionnaires that presented vignettes of fictional characters, in which they varied by: (1) character's sex (male/female); (2) the career which he/she studies (masculinised/feminised); and (3) their level of academic achievement (high/low). Results shows some effects of character's sex on attributions of academic performance. In addition, participants attribute higher expectations of future work and academic performance to women than to men. These findings show the presence of gender stereotypes in higher education and their influence on biases towards men and women. The importance of designing and implementing policies to reduce sexism in education, especially in critical groups such as women and men in counter-stereotypical careers, is discussed.

Lifelong learning and late working life: Risks and Inequalities across four European countries
Keywords: Educational Policy, Gender Issues, Lifelong Learning, Qualitative Methods
Presenting Author: Nehle Penning, TU Dortmund University, Germany; **Co-Author:**Rachel Crossdale, The University of Sheffield, United Kingdom; **Co-Author:**Monika Reichert, TU Dortmund University, Germany

This paper examines the role of lifelong learning from an international comparative and life course perspective. Raising levels of lifelong learning is viewed as central to promoting employability among older workers (Walker, 1997; Hyde and Phillipson, 2015). The extended working lives agenda requires integral support of lifelong learning throughout the life course, however opportunities and take up are often unequally distributed.This paper takes a person-centred perspective to findings from 100 interviews with older workers in Germany, Poland, Sweden, and the UK, providing original insight into how inequalities in lifelong learning are assessed in late working life. This is taken further to assess how lifelong learning influences the prevention and/or management of exclusion risk – e.g. through improving one's chances on the labour market in late working life. The link between lifelong learning and the biosocial, macro, and operational life/work courses is explored to evaluate how lifelong learning influences the potential to extend working lives both equally and inclusively. An overview of the European perspective of lifelong learning, supplemented by findings from a comparative report of macro social and political-economic change within Germany, Poland, Sweden, and the UK, informs case studies of these four countries. This contextualises the primary findings within the national policies and political-economic background of each nation to demonstrate both good and poor practice and opportunities for shared learning. Finally, these two perspectives are brought together to evaluate the potential of lifelong learning for the broader extended working lives agenda in the near- and longer-term future.

Session T 11

26 August 2023 14:45 - 16:15
UOM_A04
Single Paper
Learning and Instructional Technology, Motivational, Social and Affective Processes

Computer-supported Self- and Co-regulated Learning

Keywords: Computer-assisted Learning, Computer-supported Collaborative Learning, Digital Literacy and Learning, E-learning/ Online Learning, Emotion and Affect, Higher Education, Learning Analytics, Mixed-method Research, Self-regulated Learning and Behaviour, Social Interaction
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 08 - Motivation and Emotion, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Dely Elliot, University of Glasgow, United Kingdom

Learners engagement in shared regulation between the learner and the technology
Keywords: Computer-assisted Learning, E-learning/ Online Learning, Learning Analytics, Self-regulated Learning and Behaviour
Presenting Author: Rianne Kooi, Radboud University Nijmegen, Netherlands; **Co-Author:**Carolien Knoop-van Campen, Radboud University, Netherlands; **Co-Author:**Eliane Segers, Radboud University, Netherlands; **Co-Author:**Inge Molenaar, Radboud University, Netherlands

Many learners face difficulties with adequate Self-Regulated Learning (SRL) (Greene & Azevedo, 2010). Therefore, external support to engage in successful SRL seems needed. Learning analytics, present in adaptive learning technologies (ALTs), hold potential to provide such external SRL support (Winne, 2017). Here, we studied a design for shared regulation between an ALT and the learner. The default for the ALT in our study is to select tasks with a probability of 75% correct answers. In the current study, learners could manipulate this probability to 65, 75 or 85% probability for success after each set of tasks (i.e., *control enactment*). We examined how students engage in*control enactment* and whether *control enactment* mediated between prior knowledge and post-test in a sample of 98 5th grade students. Results showed relations between metacognitive knowledge and skills and measures for *control enactment*. An effect of prior-knowledge on *control enactment* in the mediation model indicates that students with higher prior-knowledge more often challenge themselves with a lower probability to answer the selected questions correct. However, *control enactment* did not relate to posttest after controlling for prior knowledge, and also was not found to mediate the effect between prior knowledge and post-test scores. This indicates that while students with higher knowledge -on average- do tend to challenge themselves more, this does not directly lead to higher learning outcomes. This shows need for further investigations of variation in engagement in *control enactment* between learners to help both teachers and technology to adapt SRL support to learners' needs.

Fostering Self-Regulated Learning through a Digital Tool - A Mixed Methods Study
Keywords: Digital Literacy and Learning, Higher Education, Mixed-method Research, Self-regulated Learning and Behaviour
Presenting Author: Mathias Mejeh, University of Bern, Switzerland; **Co-Author:**Livia Sarbach, University of Bern, Switzerland; **Co-Author:**Tina Hascher, University of Bern, Institute of Educational Science, Switzerland

AbstractSelf-regulated learning is essential for students in higher education to be successful learners. The relevance of feedback for successful SRL is undisputed. However, opportunities to provide learners with personalized, real-time feedback are often lacking, especially in tertiary education. Through learning analytics, continuous monitoring of learning processes can be conducted, thereby triggering specific, individualized feedback. Little research has been conducted on how far learners succeed in developing appropriate SRL on the basis of LA feedback. The present study examines the effect of a digital tool on the development of students' SRL, and how learners perceive and deal with the feedback provided by the tool. It turns out that (a) certain aspects of SRL develop positively over time (we will illustrate this in our paper using the example of "goal orientation"), (b) both intra-individual and inter-individual differences can be shown, and (c) students perceive the digital tool positively, however, the use and benefit strongly depends on their individual situation during the semester.

Supporting regulated learning in collaboration in higher education
Keywords: Computer-supported Collaborative Learning, Higher Education, Mixed-method Research, Self-regulated Learning and Behaviour
Presenting Author: Suijing Yang, The University of Queensland, Australia; **Co-Author:**Jason Lodge, The University of Queensland, Australia; **Co-Author:**Cam Brooks, The University of Queensland, Australia; **Co-Author:**Jingyang Ai, University of the West of Scotland, United Kingdom

The aim of this study was to develop and examine metacognitive prompts to support content monitoring in collaborative learning in higher education. A digital scaffolding tool was developed to deliver the prompts to collaborative groups. This study employed two process-oriented case studies to explore how prompts influence the dynamic interplay of self-, co-, and socially shared regulatory processes with different foci in collaboration. Meanwhile, the dynamic changes in students' perceived challenges and perceived helpfulness of prompts were investigated. Video and video-stimulated recall interview data were collected from first-year undergraduate students in a scaffolded collaborative task. Process mining and qualitative methods were used to capture temporal and sequential patterns of regulatory processes, students' interpretations, and perceptions over time. Results showed that the prompts facilitated students to review task understanding and assess their content development against the task criteria at the individual- and social levels. Externalisation of perceived challenges was evidenced when students engaged in prompted content monitoring activities. Moreover, the prompts were found to promote additional regulatory processes besides the prompted activities.

Understanding social emotions and their regulation in online CSCL
Keywords: Computer-supported Collaborative Learning, Emotion and Affect, Higher Education, Social Interaction
Presenting Author: Sabrine Hassane, Open University of the Netherlands, Netherlands; **Co-Author:**Jorrick Beckers, Open University of the Netherlands, Netherlands; **Co-Author:**Karel Kreijns, Open University of the Netherlands, Netherlands

Online computer supported collaborative learning (CSCL) could be challenging for students attending distance higher education. These challenges become troublesome when negative emotions emerge thereby strongly influencing the learning process. Therefore, students need to regulate their emotions to collaborate successfully. Yet, little is known about emotion regulation, especially among students in online distance education. In the current study, we investigated the socio-emotional challenges, social emotions and their regulation in online CSCL. We used the Adaptive Instrument of Emotion Regulation (AIRE) corroborated with interviews to gain insight in the quantitative data. The results revealed that about 89% of the students experienced more than one socio-emotional challenge during the online collaboration. These challenges involved differences in personal life, differences in understanding of the task, group members who were not fully committed to the task and differences in interaction styles. These challenges gave rise to negative social emotions: such as disappointment, dislike, shame, anger and guilt. Finally, regulation of emotion seemed to be focused more on the self- and socially shared level, but less on the co-regulation level. Interviews revealed that socio-emotional challenges coincided with negative social emotion and that the students did not always feel safe to discuss their emotions among their group members. On the other hand, during successful collaboration students felt safer, had open conversations, and experienced more positive social emotions, including respect, sympathy, and trust. In conclusion, this study paints a rich picture of emotion regulation during both successful and unsuccessful online collaborations.

Session T 12

26 August 2023 14:45 - 16:15
UOM_A08
Single Paper
Higher Education, Teaching and Teacher Education

Teachers' Collaborative Practices

Keywords: Cooperative/Collaborative Learning, Engineering Education, Higher Education, In-service Teachers, Knowledge Construction, Mixed-method Research, Qualitative Methods, Quantitative Methods, Social Interaction, Teacher Professional Development, Teaching Approaches
Interest group: SIG 04 - Higher Education, SIG 10 - Social Interaction in Learning and Instruction
Chairperson: Heli Aomets, Tallinn University, Estonia

Teachers' assessments of their collaboration practices
Keywords: Cooperative/Collaborative Learning, In-service Teachers, Qualitative Methods, Social Interaction
Presenting Author: Katrin Saks, University of Tartu, Estonia; **Co-Author:**Pihel Hunt, University of Tartu, Estonia; **Co-Author:**Äli Leijen, University of Tartu, Estonia; **Co-Author:**Liina Lepp, University of Tartu, Estonia

Contemporary models of teacher professionalism assume continued professional learning and collaboration with colleagues. The TALIS survey showed that deep levels of teacher collaboration are rather rare. This paper investigates the teachers' collaborative practices in the frame of teacher-teacher interaction continuum. The qualitative study with semi-structured interviews with 18 Estonian teachers revealed more frequent collaborative activities on the lower levels - creating positive working atmosphere, supportive relationships and mutual trust on the level of *storytelling and scanning*; and asking for help with classroom management and teaching methods, and providing help only when it was asked for, on the level of *aid and assistance*. Assisting and *sharing* became more important during the Covid-period when teaching was done online and personal contacts were rare. *Joint work* revealed the focus on students predominantly in the context of problem-solving or classroom discipline, much less in the context of enforcing their learning process or wellbeing at school.
Teamwork as the highest form of collaboration with strong interactions and interdependence was found to be launched by the will to create something new and

meaningful without jeopardizing teachers' sense of personal autonomy, sense of freedom and decision-making. In addition, this study proposes an additional unit to the interaction continuum - *no interaction*. This level stays deeply individualistic in the generally collaborative environment.

Evaluating the impact of a pedagogical training program offered to awarded university teachers
Keywords: Cooperative/Collaborative Learning, Higher Education, Mixed-method Research, Teacher Professional Development
Presenting Author: Radu Balan, West University of Timisoara, Romania; **Co-Author:**Purtan Nadia, West University of Timisoara, Romania; **Co-Author:**Velibor Mladenovici, West University of Timisoara, Romania; **Co-Author:**Marian Ilie, West University of Timisoara, Romania

This study presents the impact analysis of a pedagogical training program offered to 20 beneficiaries of a university teaching grant. The impact evaluation had a quantitative quasi-experimental design with two measurement points (pretest and posttest), both at the faculty level and at the students' level. We measured the faculty's conceptions about teaching, their teaching approaches, and their psychological resources. At the student's level, we measured their approaches to learning and their evaluation of the faculty's behavior during class. Two-way mixed ANOVA, Quade's ANCOVA, and Mann-Whitney U were conducted to analyze the collected data, depending on the compliance with the assumptions related to hypothesis testing. On the one hand, the results showed that after the program there were significant differences between faculty from the experimental group (EG) and control group (CG) in their perceptions of active learning appreciation and psychological resilience, with CG faculty reporting higher scores at the end of the program. On the other hand, the training program had significant positive effects on the faculty's behaviors of fostering active learning and the method of assessment in a student-centered manner, with EG students reporting a higher frequency of these behaviors from their teachers compared to CG students. Regarding the students' approaches to learning, the results were insignificant. Generally, we identified significant differences between the two groups only on variables that did not have high values at the initial measurement. Implications for planning the impact evaluation process of similar programs are discussed.

Exploring faculty members' diverse perspectives on interdisciplinary higher education
Keywords: Cooperative/Collaborative Learning, Engineering Education, Higher Education, Teaching Approaches
Presenting Author: Xiaoqi Feng, Aalto University, Finland

Interdisciplinary initiatives have been encouraged in higher education curricula, especially in engineeringeducation as a result of global calls for future graduates with interdisciplinary competencies to co-create solutions for tackling complex real-world problems. While many studies found benefits of interdisciplinary education to students' learning, teachers still reported a number of pedagogical challenges in teaching, such as navigating the disciplinary differences when collaborating across disciplines, as well as balancing the trade-off between depth versus breadth of disciplinary knowledge in teaching. Since teachers' effective teaching practices are closely related to their beliefs, the present study investigated teachers' perspectives and experiences in interdisciplinary education. Semi-structured interviews were conducted with 13 faculty members from engineering, business, art and design with varied teaching, course design, and management experiences. The analysis showed that while faculty members converged on the importance of collaboration, they tended to adopt different pedagogical approaches in interdisciplinary education, due to their different disciplinary epistemologies. By uncovering faculty members' perspectives and experiences, this study can help faculty members derive an in-depth understanding of their own and others' conceptions of interdisciplinary education to facilitate effective teaching collaborations.

Peer Assisted Study Scheme (PASS) and its potential benefits for participants and facilitators
Keywords: Cooperative/Collaborative Learning, Knowledge Construction, Qualitative Methods, Quantitative Methods
Presenting Author: William Carey, Lund University / Loughborough University, Sweden; **Co-Author:**Joakim Malm, Lund University, Sweden; **Co-Author:**Lise-Lotte Mörner, Lund University, Sweden

PASS is a 50-year-old proven peer-learning model that addresses student engagement, learning, performance and retention as well as the transition to Higher Education (HE). PASS combines 'how to learn' with 'what to learn', using collaborative activities under the guidance of a 'senior' student – the PASS Leader. The PASS leaders are trained in the concept of PASS, collaborative techniques, group dynamics, etc., before starting their work, and are supervised continuously during their service. PASS is internationally well-established and is found in some 30 countries at 1000+ higher education institutes. The present study addresses the potential benefits of PASS for student participants and PASS leaders based on attendance and performance data as well as information from surveys taken from a European University. Results show that student attendees perform better on exams, which is consistent with other studies. Furthermore, they improve upon skills like teamwork, problem solving, critical thinking and improve their confidence that will help them in future studies. The PASS leaders also improve upon various transferable skills like communication, leadership and group management that gives them an advantage later in working life. This development of "soft" skills for PASS participants and leaders have received little attention before and are of value as it contributes to some of the graduate attributes HE Institutes (HEIs) want to achieve.

Session T 13

26 August 2023 14:45 - 16:15
UOM_CR
Single Paper
Higher Education

Friendships, Social Interaction and Social (In)Exclusion

Keywords: Attitudes and Beliefs, Bullying, Gender Issues, Higher Education, Inclusive Education, Motivation, Peer Interaction, Social Development, Social Interaction
Interest group: SIG 08 - Motivation and Emotion, SIG 15 - Special Educational Needs
Chairperson: Daniela Nussbaumer, University of Applied Sciences of Special Needs Education, Switzerland

Friendships in inclusive classrooms – network analysis from teachers' and students' perspectives
Keywords: Inclusive Education, Peer Interaction, Social Development, Social Interaction
Presenting Author: Katharina-Theresa Lindner, University of Vienna, Austria

Empirical findings show that building friendships as well as having friends influences students' academic, socio-emotional as well as health development. In this context, recent studies indicate lower social participation in school of students with special educational needs (SEN) and that they lack friendships (Avramidis et al., 2018; Bossaert et al. 2013; Hassani et al. 2020; Koster et al. 2009; Schwab 2018). In light of these findings, friendship analysis in inclusive school settings seems particularly interesting for tracing the social connectedness of students with and without SEN and for explaining any differences that may exist. Within a sequential explanatory design, two study phases have been implemented in the present study. In phase 1, a sociometric network analysis of 449 students from 25 inclusive primary school classes were examined. Results showed that the agreement of students' and teachers' rating varies strongly across classes ($r = .18 – .71$). In phase 2, interview data from a subsample (a sub-sample selected from phase 1) comprising teachers ($n = 2$) and students ($n = 15$) was qualitatively analyzed. The evaluation of teachers' interviews identified three explanations for missing accuracy in the sociometric networks. From students' interviews, six subcategories describing friendship were found.

Students' friendships - The role of gender & self-perceived social inclusion in inclusive classrooms
Keywords: Gender Issues, Inclusive Education, Peer Interaction, Social Interaction
Presenting Author: Ariana Garrote, University of Applied Sciences and Arts Northwestern Switzerland, School of Education, Switzerland; **Co-Author:**Carmen Zurbriggen, University of Fribourg, Switzerland; **Co-Author:**Susanne Schwab, University of Vienna, Austria

Friendships with classmates play a significant role for every student's social and academic development. However, only some friendships are maintained longer than a school year, and their formation depends on social processes. At the dyadic level, the social process of gender homophily is consistently found in friendship networks: girls are more likely to befriend girls and boys are more likely to befriend boys. There are also social processes at a classroom level,

namely network effects, that influence the formation of friendships, such as density, transitivity, and reciprocity. For the social inclusion of students, it is not only important to have friends but also to feel socially included. Few studies investigate social inclusion along different dimensions, such as friendships and self-perceived social inclusion. Thus, there is little knowledge about the relationship between students' friendships and their perception of inclusion. To contribute to this research gap, friendship networks of 280 students aged 9 to 11 years (49% girls) in 15 classes of grade 4 were examined longitudinally during a school year. Changes in friendship networks from the beginning to the end of the school year were analyzed with social network analyses. Gender and self-perception of inclusion were added as covariates. Network effects (e.g., reciprocity, transitivity) were included in the model. The results confirmed gender homophily and showed that students who perceived themselves as included were more likely chosen as friends by classmates, whereas feeling included did not predict naming friends. This suggests that peers substantially contribute to students' perception of their inclusion.

Improving students' attitudes towards peers with special needs: Results from an intervention study
Keywords: Attitudes and Beliefs, Inclusive Education, Peer Interaction, Social Interaction
Presenting Author: Marwin Felix Loeper, Paderborn University, Germany; **Co-Author:**Gamze Görel, Paderborn University, Germany; **Co-Author:**Frank Hellmich, Paderborn University, Germany

In our study, we evaluated the effects of a newly developed intervention approach to foster primary school students' social participation in the inclusive classroom on their attitudes towards peers with learning difficulties and their attitudes towards peers with difficulties in their social-emotional development. *N*=503 students from the third and the fourth grade participated in our study. Half of the students (*n*=259) took part in the six-week intervention program to foster their social participation. Meanwhile, the other half of the students (*n*=244) attended their regular school lessons and therefore acted as an inactive control group. Before and after the intervention, we investigated students' attitudes towards their peers with learning difficulties and towards their peers with social-emotional difficulties by means of a questionnaire.The results of an ANOVA with repeated measures revealed a significant effect of the intervention on students' attitudes towards their peers with learning difficulties and their attitudes towards peers with social-emotional difficulties. Thus, the attitudes of the students in the intervention group significantly increased from the pre to the post measurement, whereas the attitudes of the students in the control group remained stable or even decreased. Overall, our findings confirm the effectiveness of a school-based intervention to foster students' social participation in the inclusive classroom for the development of their positive attitudes towards peers with special educational needs.

University students' behavioural intentions towards social exclusion
Keywords: Bullying, Higher Education, Motivation, Peer Interaction
Presenting Author: Mareike Brehmer, University of Agder, Norway; **Co-Author:**Jennifer Meyer, Leibniz-Institute for Science and Mathematics Education, Germany

Social exclusion from group activities is a prevalent issue among students in higher education and poses challenges to a safe and inclusive learning environment. We conceptually replicated and extended a study by Hayashi and Tahmasbi (2021) to investigate to what extent the Theory of Planned Behaviour may predict university students' behavioural intentions towards in-person peer social exclusion. The Theory of Planned Behaviour assumes that a person's attitudes towards a behaviour, their subjective norms deriving from significant others, and their perceived behavioural control predict their intention to execute the behaviour in question. In the above-mentioned study, empathy and anticipated regret were found to be significant predictors of intention, over and above the standard variables. We analysed data collected online from *N*=420 undergraduate students to examine to what extent attitudes, subjective norms, perceived behavioural control, empathic concern and anticipated regret predicted various prosocial and antisocial behavioural intentions towards peer social exclusion in university students. Preliminary findings suggest that among the standard variables proposed by the Theory of Planned Behaviour, perceived behavioural control and cognitive attitudes were those with the most significant effects on the outcome variables. Furthermore, empathic concern and anticipated regret significantly contributed to the prediction of both prosocial and antisocial behavioural intentions.

Session T 14

26 August 2023 14:45 - 16:15
UOM_A07
Single Paper
Developmental Aspects of Instruction, Learning and Instructional Technology, Learning and Social Interaction

Simulation-based Learning

Keywords: Competencies, Health-care Education, Higher Education, Interest, Knowledge Construction, Meta-analysis, Qualitative Methods, Science Education, Simulation-based Learning, Social Aspects of Learning and Teaching, Social Interaction, Teaching/Instructional Strategies
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 14 - Learning and Professional Development
Chairperson: Chiel van der Veen, Vrije Universiteit Amsterdam, Netherlands

Authentic tasks and Scaffolding in Higher Education: a Meta-Analysis on Effects of Simulations
Keywords: Higher Education, Meta-analysis, Simulation-based Learning, Teaching/Instructional Strategies
Presenting Author: Olga Chernikova, Ludwig Maximilian University, Germany; **Co-Author:**Doris Holzberger, Technical University of Munich (TUM) & ZIB (Centre for International Student Assessment), Germany; **Co-Author:**Nicole Heitzmann, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Matthias Stadler, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany; **Co-Author:**Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

This meta-analysis is based on 152 empirical studies and investigates the relationship between task authenticity and scaffolding in simulation-based learning environments and their role in facilitating complex cognitive skills in higher education. We explored different types of scaffolding and their additional value for simulations with high and low levels of task authenticity. The analysis revealed that additional scaffolding in form of providing reflection phases is beneficial for highly authentic tasks in simulations but providing examples or prompts as the only support measure in simulation is rather counter-productive. For simulations with low task authenticity, different types of scaffolding contribute to effectivity similarly well. We conclude that providing different types of scaffolding can support simulations, but also lower the effects on learning outcomes if not properly matched with tasks.

Can simulation-based training shape professional identity in addition to competencies?
Keywords: Competencies, Health-care Education, Qualitative Methods, Simulation-based Learning
Presenting Author: Pauliina Rikala, University of Jyväskylä, Finland; **Co-Author:**Minna Ruoranen, University of Jyväskylä, Finland; **Co-Author:**Kaisa Silvennoinen, University of Jyväskylä, Finland; **Co-Author:**Aaron Peltoniemi, University of Jyväskylä, Finland; **Co-Author:**Raija Hämäläinen, University of Jyväskylä, Finland

There has been a great deal of theoretical and empirical research focused on the construction of professional identity in healthcare. However, discourse on the relationship between simulation-based training and the construction of professional identity remains meagre. The purpose of this preliminary study is to provide insight into the competences that are fundamental in professional identity and are constructed in high-fidelity healthcare simulation-based training situations involving multi-professional interaction and hands-on activities. In our study, we focus on the contents of video-recorded scaffolding between the trainer and trainees during healthcare simulation-based training and debriefing. We aim to answer the question of what competences are present in the scaffolding and how they reflect projected learning goals. Based on available literature and content analysis of the video-recordings, we discuss the potential of simulation-based training as an important constructor of professional identity for training professionals in healthcare. Our preliminary results reveal that, overall, the competences relevant for professional identity construction include practical skills, communication and collaboration, which were also well reflected in the projected learning goals. In addition, during the debriefing, it was noticed that individual learning experiences were not explicitly communicated among colleagues. This raises the question of whether some themes, such as motives, motivation or emotions, that may be significant to professional identity construction were left unaddressed. We hope to provide some suggestions for simulation designers and trainers to better design and implement healthcare training that supports the construction of

professional identity for trainees. Final results will be presented at the conference.

Social embedding in virtual learning simulations and its relation to the quality of task solution
Keywords: Higher Education, Simulation-based Learning, Social Aspects of Learning and Teaching, Social Interaction
Presenting Author: Anke Braunstein, University of Mannheim, Germany; **Co-Author:**Viola Deutscher, University of Mannheim, Germany

Virtual learning simulations (VLS) are on the rise as they reflect realities more authentically in learning processes and thus help learners to solve authentic tasks in an action-oriented approach. Since real-life learning largely occurs through social interactions between learners, the question arises to what degree these social interactions can be represented in VLS and how social embedding effects task-solving, perceived authenticity, enjoyment and social immersion. For this purpose, the commercial work task of a supplier selection is implemented in the VLS *LUCA Office Simulation*. Here, the task was adapted to four different degrees of social interaction ('no social embedding', 'social placement', 'social interaction' and 'collaborative interaction'). Learners are assigned randomly to the different levels of social embedding. We analyze the effects of the degree of social embedding on task-solving, perceived authenticity, enjoyment, and social immersion via a one-way MANOVA on 120 economic and business education students. The preliminary results so far indicate an improvement in task solving with an increase in the degree of social embedding. Furthermore, it becomes clear that with the increase of social embedding learners' perceived authenticity of a task, enjoyment as well as immersion increase.

Task perception, task performance, and learning outcomes in simulation-based inquiry learning
Keywords: Interest, Knowledge Construction, Science Education, Simulation-based Learning
Presenting Author: Tomi Jaakkola, Tampere University, Finland; **Co-Author:**Koen Veermans, University of Turku, Department of Teacher Education, Finland

The positive effects of computer-simulations on learning outcomes are clearly demonstrated in the literature. However, it is less well understood how situational factors during learning with simulations are connected to each other and how they might mediate the learning outcomes. To this end, the present study investigates how students' task perception (interest in the task and perceived task difficulty) and task performance (quality and fluency of learning) in a simulation are connected to learning outcomes and prior knowledge and interest, and how these factors interact with each other while students carry out experiments in the simulation. Participants of the study were 115 upper elementary school students. Preliminary results showed an interesting interaction between different process variables measured during learning, but learning outcomes were only explained by prior knowledge. The results of the study can provide more detailed information on how different situational variables relate to the learning outcomes obtained from simulations and they help us to better understand the learning processes that take place in a simulation environment.

Session T 15

26 August 2023 14:45 - 16:15
AUTH_T202
Single Paper
Assessment and Evaluation, Culture, Morality, Religion and Education, Learning and Instructional Technology

Dashboards, Learning Analytics and Educational Technologies

Keywords: Assessment Methods, Attitudes and Beliefs, Computer-assisted Learning, Digital Literacy and Learning, E-learning/ Online Learning, Educational Technologies, Ethics, In-service Teachers, Learning Analytics
Interest group: SIG 01 - Assessment and Evaluation, SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Jean-Michel Boucheix, University of Dijon, LEAD-CNRS, France

Students Value Alignments and Tensions with Learning Analytics
Keywords: Attitudes and Beliefs, Educational Technologies, Ethics, Learning Analytics
Presenting Author: Egle Gedrimiene, University of Oulu, Finland; **Co-Author:**Hanni Muukkonen, University of Oulu, Finland

Learning analytics (LA) tools are getting increasingly popular in higher education (HE). This process has been especially facilitated by recent Covid-19 pandemic and increase in distance education. However, ethical concerns and low acceptance from users reported in previous literature stimulates the search for constructs that could serve to better understand users' experiences with LA tools and thus positively impact the LA field development. We investigate students' (N = 12) value alignment and tension experiences in connection to LA tool use in HE institution, Finland. Preliminary results from qualitative content analysis of student interviews indicate that significant value tensions as well as alignment experiences emerged in connection to LA tool use. Moreover, the value tensions distributed differently between users with educational sciences and computer science backgrounds. We conclude that values of students from educational sciences are not sufficiently accounted for in LA tool design, thus causing contradictory experiences.

The use and misuse of learning analytics dashboards: the case of UK primary schools teachers
Keywords: Computer-assisted Learning, Educational Technologies, In-service Teachers, Learning Analytics
Presenting Author: Manolis Mavrikis, UCL Knowledge Lab, United Kingdom; **Co-Author:**Eirini Geraniou, University College London, Institute of Education, United Kingdom

This paper reports on the use of Adaptive Learning Technologies (ALTs) that include learning analytics (LA) in the form of data visualisation (dashboards) and other means of providing information for teachers. Following a qualitative methodology we interviewed teachers and teaching assistants who extensively use such tools in practice and look into their beliefs, competences and data literacy skills and how these, together with the broader educational context and their specific goals, shape their practice. Analyzing their interactions, and common breakdowns and misconceptions, we provide recommendations for dashboard design and teacher training. The results point to the need for further research into the relationship between teachers' data literacy and the actions and nuanced decisions they take based on the dashboards. The paper also highlights the importance of looking into the whole school and broader educational context including how or whether teachers involve parents and learners in making sense of the data.

Automated Short Answer Grading using BERT on German datasets
Keywords: Assessment Methods, E-learning/ Online Learning, Educational Technologies, Learning Analytics
Presenting Author: Sukanya Nath, Swiss Distance University of Applied Sciences (FFHS), Switzerland; **Co-Author:**Behnam Parsaeifard, Swiss Distance University of Applied Sciences (FFHS), Switzerland; **Co-Author:**Egon Werlen, Swiss Distance University of Applied Sciences (FFHS), Switzerland

Owing to a growth in online learning, the interest in automated grading has intensified, especially due to scoring time reduction. The aim of automated grading is to approximate human level scoring. Automated Short Answer Grading (ASAG) is a subfield under automated grading, where the length of the answers ranges from a few words to a few sentences. Recently, transformer-based models have improved the state-of-the-art performance in several Natural Language Processing tasks, including ASAG. While a lot of work has focused on English language datasets, not enough attention has been paid to other languages such as German. In this study, we experiment with fine-tuned Bidirectional Encoder Representations from transformers (BERT;Devlin et al. 2018), on German ASAG datasets. We show that the BERT approach beats the bag-of-words (BOW) similarity-based approach by a substantial margin.

Primary school teachers' skills to perceive, interpret and make decisions based on dashboards
Keywords: Digital Literacy and Learning, Educational Technologies, In-service Teachers, Learning Analytics
Presenting Author: Rani Van Schoors, KU LEUVEN, Belgium; **Co-Author:**Stefanie Vanbecelaere, KU Leuven, Belgium; **Co-Author:**Line Deprez, KU LEUVEN, Belgium; **Co-Author:**Antje Demulder, KU LEUVEN, Belgium; **Co-Author:**Fien Depaepe, KU Leuven, Belgium

Digital tools are increasingly used in primary education for learning purposes. These digital learning tools often contain a dashboard which shows the teacher aggregated data of the interactions between the learner and the digital tool. Teachers need to transform the data presented on dashboards into information which they can use to inform their teaching. Whether these dashboards improve teaching quality and lead to more personalization in the classroom depends to

a large extent on the teacher's competence. According to the competence model of Blömeke and colleagues (2015), competence is viewed as a continuum consisting of dispositions, situation-specific skills and performance. So far, limited empirical evidence is available about teachers' competence to use dashboards. In this study, we focus on teachers' situation-specific skills (i.e. how teachers perceive, interpret and make decisions based on the data presented on dashboards). In total 45 primary school teachers participated. Each participant participated in an interview measuring their situation-specific skills. The interviews were coded and scored based on a rubric developed using available literature. Results regarding teachers' situation-specific skills showed high variability across teachers. On average, for most subdimensions of perception, teachers address several aspects of the dashboards in detail and concretely. However, the subdimensions of interpretation and decision-making were fairly limitedly addressed. Moderate to high correlations were observed between perception, interpretation and decision-making skills. It can be concluded that teachers' situation-specific skills are currently limited, especially when it comes to interpreting and making decisions based on data.

Session T 16

26 August 2023 14:45 - 16:15
UOM_A11
Single Paper
Higher Education, Instructional Design, Lifelong Learning

Developing Writing Skills and Competencies

Keywords: Argumentation, Bilingual Education, Cognitive Development, Cooperative/Collaborative Learning, Higher Education, Instructional Design, L1/Standard Language Acquisition, Learning Approaches, Lifelong Learning, Secondary Education, Self-efficacy, Writing/Literacy
Interest group: SIG 12 - Writing
Chairperson: BENGU CILALI, Bilkent University, Turkiye

Developing plurilingual writing competence in collaborative and cooperative settings
Keywords: Bilingual Education, Cooperative/Collaborative Learning, Learning Approaches, Writing/Literacy
Presenting Author: Olivia Rütti-Joy, St.Gallen University of Teacher Education, Switzerland; **Presenting Author:**Valentin Unger, St.Gallen University of Teacher Education, Switzerland

Societies are becoming more dynamic, heterogeneous, diverse and increasingly more plurilingual in the 21st century. To be able to successfully thrive within and navigate these increasingly complex societal structures requires numerous sophisticated competences that schools need to account for in the reconceptualisation of their curricula. One of these competences constitutes plurilingual writing – a highly important and strategic skill that shapes the way knowledge is constructed and shared, not least because knowledge is primarily communicated through writing. Despite this high relevance, many students fail to write appropriately, effectively and communicatively. These difficulties can, among others, be attributed to the highly complex nature of writing. Students therefore need targeted support in developing their (plurilingual) writing competence. One way of supporting learners is to integrate pluralistic i.e. plurilingual and cooperative and/or collaborative approaches in a unified educational context, as such a combination to writing instruction may contribute effectively to sustainable plurilingual writing competence development. This theoretical paper presents an attempt to promote change in language education and seek to better equip language learners with the learning strategies, resources and language competences needed for global citizenship in the 21st century by proposing a didactic model for plurilingual writing competence development in collaborative and cooperative didactic settings in the lower-secondary level language classroom. The proposed model was developed in an interative multi-stage process with the involvement of leading experts in the field. Aside from the methodology employed, affordances and limitations of the model as well as future research trajectories will be outlined.

Developing revision skills: Studying real-time writing processes to inform instruction practices
Keywords: Cognitive Development, L1/Standard Language Acquisition, Lifelong Learning, Writing/Literacy
Presenting Author: Victoria Johansson, Kristianstad University, Sweden; **Co-Author:**Åsa Wengelin, University of Gothenburg, Sweden

This contribution aims to give an overview of how revision during writing is used by writers across the school curriculum until adulthood. In doing so it wants to identify revision patterns typical for specific age groups, and explore some qualitative differences in revision practices, with the purpose to inform e.g. writing instruction practices. We ask qualitative and quantitative research questions: Does the amount of revision (in proportion of time on task, and in number of revised characters) differ across the school age? In which contexts do participants revise, and does this differ between the ages? Are there any qualitative differences between the revision strategies of children, adolescents and adults? The cross-sectional comparisons are made through empirical data consisting of experimentally collected texts, using keystroke logging, which allows for the in-depth study of what has been deleted and when, and for analyzing revisions and planning patterns (through pauses) at the same time. In total, 170 narrative and expository texts by writers age 9–18, and adults are analyzed. The results show no linear connection between increase in age and amount of deleted text. The analyses of revision strategies reveal that students until 15 years of age are linear in both text generation and revision. In the later part of adolescence more students rearrange the texts more, both through text deletion, reworking what is written, and adding information. The adult controls adapt a more global revision perspective, and often rework a greater part, if not all of their texts.

A study on the impact of explicit instruction and collaborative writing on argumentative writing
Keywords: Argumentation, Instructional Design, Secondary Education, Writing/Literacy
Presenting Author: Yana Landrieu, Ghent University, Belgium; **Co-Author:**Fien De Smedt, Ghent University, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium; **Co-Author:**Bram De Wever, Ghent University, Belgium

Despite the key relevance of argumentative writing in contemporary society, it is agreed upon that education fails in successfully promoting students' argumentative writing skills. Recent research showed that argumentative texts are often weak and are not factual accurate, have a weak level of persuasiveness, include bad writing mechanics and often do not include counterarguments nor rebuttals. This study investigated the effect of explicit instruction and collaborative writing on secondary school students' (a) argumentative writing skills and (b) self-efficacy for argumentative writing (n=400). Moreover, this study additionally evaluated the effectiveness of alternating between individual and collaborative writing throughout the writing process. Multilevel analyses showed that explicit strategy instruction had a positive impact on students' argumentative writing skills and their self-efficacy for writing. There were no significant difference between students alternating between individual and collaborative writing and students exclusively collaborating during all phases of the writing process.

Approaches to thesis writing and writer profiles
Keywords: Higher Education, Learning Approaches, Self-efficacy, Writing/Literacy
Presenting Author: Laura Mendoza, University of Helsinki, Finland; **Co-Author:**Sari Lindblom, University of Helsinki, Finland; **Co-Author:**Tuula Lehtonen, University of Helsinki, Finland; **Co-Author:**Heidi Hyytinen, University of Helsinki, Finland

Master's thesis is a complex task for most students, requiring students to conduct research and write about it while they are still in the process of learning such a skill. Through a person-oriented approach, this study investigates the interrelations between students' approaches to master's thesis writing, the perceptions of the thesis as a teaching-learning environment, self-efficacy for thesis writing, and thesis grade in a Finnish university. Master's thesis writers from engineering fields (N=283) participated in this study by answering a survey. In addition, their thesis grade was obtained separately from the study register. Three profiles of thesis writers were identified based on the individual variation in approaches to thesis writing: 1) Students applying a dissonant approach; 2) Students applying a deep and organized approach; 3) Students applying an unorganized approach. Students applying a deep and organized approach to thesis writing differed from the other two groups at significant levels with a higher thesis grade and higher levels of self-efficacy for thesis writing. They also reported more positive experiences of the thesis as teaching and learning environment, with higher levels of interest and relevance as well as feedback and supervision.

Session T 17

26 August 2023 14:45 - 16:15
AUTH_TE2
Single Paper
Assessment and Evaluation, Instructional Design, Learning and Social Interaction

Digital Literacy and Learning in Primary and Secondary Education

Keywords: Assessment Methods, Cognitive Skills and Processes, Communication Skills, Competencies, Comprehension of Text and Graphics, Cooperative/Collaborative Learning, Digital Literacy and Learning, Pre-service Teachers, Secondary Education, Writing/Literacy
Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 12 - Writing
Chairperson: Kimberly Norrman, Sweden

Digital natives = digital experts? Designing a novel instrument to measure digital competence
Keywords: Assessment Methods, Competencies, Digital Literacy and Learning, Secondary Education
Presenting Author:Sümeyra Tural, Leibniz Institute for Educational Trajectories, Germany; **Co-Author:**Mariann Schwaß, Leibniz Institute for Educational Trajectories, Germany

With the digitization of modern day society, the competence of handling information and communication technologies (ICT) has become increasingly significant. Newer generations are often labelled as ‘digital natives’ (Prensky, 2001), which implies a certain level of competence. Scientific evidence, however, indicate the ongoing challenge that the internet can pose for adolescents and emphasize the importance of teaching children a critical and reflected approach (Vlacke et al., 2010).In order to capture the aspect of critical reflection, a new test to measure ‘digital competence’ has been developed for Starting Cohort 8 of the NEPS. The test aims to reflect the knowledge that is needed to responsibly approach the possibilities and the risks of digital media and also to reflect not only on its content, but also to identify its modes of action. In a synthesis and extension of former research (e.g. Calvani, Fini & Ranieri, 2009; Carreto, Vuorikari & Punie, 2017; Dannelse, 2009; Fraillon et al., 2019), four main facets with multiple subfacets were defined: (1) *Information competence,* (2) *Detection of intentions and strategies*, (3) *Communication and interaction competence,* and lastly, (4) *Data handling competence.* The computer based test to measure digital competence will first be applied in a pilot study for the NEPS-SC8 starting in 2022. Data will be gathered in regular schools and schools for children with learning difficulties, in grade 6 and 8, respectively. This presentation aims to introduce the conceptual framework for this novel test domain and to show analyses on the test quality and its dimensionality.

Fostering text integration in primary education: What type of instruction should teachers provide?
Keywords: Assessment Methods, Cognitive Skills and Processes, Comprehension of Text and Graphics, Digital Literacy and Learning
Presenting Author: Raquel Cerdan, University of Valencia, Spain; **Co-Author:**Fátima Rahim, University of Valencia / Interdisciplinary Research Structure for Reading Research (ERI Lectura), Spain; **Co-Author:**Ignacio Máñez, University of Valencia / Interdisciplinary Research Structure for Reading Research (ERI Lectura), Spain; **Co-Author:**Jason L.G. Braasch, Georgia State University, United States

We explored how receiving different types of reading instructions affects primary school students' integration of conflicting pieces of information and the identification of source features. Primary school children read four short texts and were asked to write an essay on the controversy about becoming vegetarian. Half of the participants received an *academic task instruction*, demanding to read and summarize the information from the texts to justify the convenience to become vegetarian, based on the information in the texts. The rest of the participants received a *personalized task instruction*, with an instruction to write to give some advice to a relative. Students performed the reading and essay writing on the computer. In a second session, they completed a post-learning essay on paper, with a general recall prompt and a memory for ideas and sources task. Contrary to our expectations, no significant effects were found for the experimental essay. For the post-learning essay measures, students reading for an academic purpose included more inferences and a higher number of against vegetarianism ideas, showing that those students focused on different sides of the controversy. Further studies that compare other types of task instructions and consider the influence of students’ reading skills and background knowledge, should help us to better understand this effect.

Digital multimodal message quality and features that affect it: an exploratory study
Keywords: Communication Skills, Digital Literacy and Learning, Pre-service Teachers, Writing/Literacy
Presenting Author: Ilias Karasavvidis, University of Thessaly, Greece

Communication through multiple modes has become standard in modern textual landscapes. Yet, neither the quality of digital multimodal messages has been mapped out nor is it known how it varies as a function of specific message features. The present study aims to (a) assess multimodal message quality using an ensemble of psychometrically valid instruments and (b) identify how specific message features influence this quality. This study examined 208 digital multimodal messages created by student teachers in the context of an undergraduate course on digital media. The main course deliverable was a digital multimodal message in the form of a short digital video. Two graduate students coded the messages using four widely used scales from the areas of communication and entertainment. Message features such as duration, number and type of semiotic resources, number of video effects were used as independent variables. The composite variables that were computed for each scale served as dependent measures. A series of single factor MANOVA indicated that the perceived quality of the digital multimodal messages depended neither on the message duration nor on the number or type of semiotic resources used. Yet, both the number of video effects and captions affected the perceived message quality. Higher levels of video effects and captions led to increased perceived quality for four of the dependent variables. The paper is concluded with a discussion of the findings and their implications for future work in assessing multimodal message quality.

Student groups evaluating their group work behaviour and learning of critical online reading
Keywords: Cognitive Skills and Processes, Cooperative/Collaborative Learning, Digital Literacy and Learning, Secondary Education
Presenting Author: Miika Marttunen, University of Jyväskylä, Finland; **Presenting Author:**Minna Lakkala, University of Helsinki, Finland; **Co-Author:**Timo Salminen, University of Jyvaskyla, Finland; **Co-Author:**Liisa Ilomäki, University of Helsinki, Finland

The study examined upper secondary school student groups' (n = 72) self-evaluations of their group work behaviour and learning of critical online reading during an online inquiry task. The analyses focused on aspects of critical online reading (author, venue, intentions, evidence, corroboration, perspectives, information search, sources), describing group practices (coordination, division of work, shared responsibility, co-construction, joint discussions, helping others and asking for help) and evaluation of group work (members’ contribution, coordination, inquiry task success, collaboration, general success). For learning of critical online reading the most often mentioned aspects were sources (86.1% of the groups), perspectives (43.1%), and author (37.5%). The total number of aspects mentioned suggests that the extent of perceived learning was low among 51.4% of the groups (moderate 34.7%; high 13.9%). The most often mentioned aspect in describing group practices was division of work (79.2% of the groups). In the evaluation of group work, member contribution was evaluated most often (77.8%). A majority of the groups (52.8%) mentioned four or five aspects of group work practices or evaluation which implies moderate ability to conduct or reflect on group work. The results suggest that the students’ learning of critical online reading and reflecting on group work jointly was not very extensive. The results also suggest that, in some schools, students have good opportunities to practice group work and develop their competencies in reflecting collaboration. Further, some interdependence seems to exist between content learning and group work skills.

Session T 18

26 August 2023 14:45 - 16:15
UOM_A13
Single Paper
Cognitive Science, Higher Education, Motivational, Social and Affective Processes

Epistemic Beliefs and Emotions

Keywords: Assessment Methods, Attitudes and Beliefs, E-learning/ Online Learning, Emotion and Affect, Engagement, Higher Education, Knowledge

Construction, Learning Approaches, Metacognition, Problem Solving, Quantitative Methods, Reasoning, Science and STEM
Interest group: SIG 08 - Motivation and Emotion, SIG 16 - Metacognition and Self-Regulated Learning
Chairperson: Kirsti Lonka, University of Helsinki, Finland

Epistemic development during the three first undergraduate years in five academic professions
Keywords: Attitudes and Beliefs, Higher Education, Learning Approaches, Metacognition
Presenting Author: Kirsti Lonka, University of Helsinki, Finland; **Co-Author:**Elina E. Ketonen, University of Helsinki, Finland

We looked at how epistemic beliefs changed in five disciplines that prepared for various academic professions. The participants of this 3-year longitudinal study were Finnish university students (N=502; 60% female) from five different disciplines (BA+MA programs): law, theology, science, engineering, and educational sciences (i.e., teacher students). Of these participants, there were 215 students, who participated across all three waves. We investigated the joint trajectories of university students' epistemic beliefs across the three years of study and examined, how these trajectories related to gender, discipline and academic achievement. Particularly, we explored the simultaneous development of different epistemic beliefs over time, enabling us to explore the potential synergy in epistemic change. We found statistically significant signs of reflective and practical beliefs increasing, and dualist believes decreasing over the three undergraduate years. Male students were less likely to give up dualist beliefs. Teacher students' beliefs were the most integrative to start with, but science students demonstrated highest level of epistemic change and law students became increasingly pragmatic during studying. To our knowledge, there are no other longitudinal studies on epistemic change covering several disciplines and archive measures of academic achievement. Our results were in line with Muis et al. (2006).

The Retest-Stability of Epistemic Beliefs about the Certainty of Knowledge in Science
Keywords: Assessment Methods, Attitudes and Beliefs, Knowledge Construction, Quantitative Methods
Presenting Author: Peter Edelsbrunner, ETH Zurich, Switzerland

Epistemic beliefs have been criticized to exhibit low reliability, as indicated by low estimates of internal consistency (e.g., Cronbach's Alpha). In the present study, we argue that high internal consistency is not necessary for questionnaires assessing beliefs to be reliable or valid. Beliefs represent a formative construct that should not be internally consistent; otherwise, different items would be redundant. In such cases, retest-reliability is a better index of a questionnaire's true reliability. To examine whether the retest reliability is comparable or higher than internal consistency, we posed the same four questions assessing beliefs about the certainty of knowledge in Science three times on university students with delays of one month. Our findings show that the retest-reliability of these questions was very similar to their internal consistency, and both were moderate. Based on this finding, we discuss whether we should expect consistency across different items meant to assess beliefs and if so, how we can best estimate their reliability.

Modeling learners' epistemic emotions and engagement in a university live-streaming classroom
Keywords: E-learning/ Online Learning, Emotion and Affect, Engagement, Science and STEM
Presenting Author: Tonny Menglun Kuo, Center for Teaching and Learning Development, National Tsing Hua University, Taiwan, Taiwan; **Co-Author:**Tzung-Jin Lin, School of Learning Informatics, Program of Learning Sciences, National Taiwan Normal University, Taiwan

This preliminary study explores the role of epistemic emotions in learning engagement in a university live-streaming classroom. Two waves of data (*N*=997) were collected from a research-oriented university in northern Taiwan. Through multivariate regression analysis and bootstrapping method, our data found that "boredom" and "excitement" are two critical epistemic emotions to the students when learning in the live-streaming classroom. Both of them not only directly lead to different aspects of learning engagement but also serve as mediators that connect other positive and negative epistemic emotions to learning engagement. In addition, "frustration" played an influential role in the learners' interpersonal forms of engagement (i.e., social and agentic engagement) but it did not contribute to intrapersonal forms of learning engagements (i.e., behavioral, cognitive, and emotional engagement), even controlling all the other emotions. Moreover, "curiosity" was found to be the most frequently appeared epistemic emotion in this live-streaming classroom setting. To our best knowledge, this study is the first attempt to explore the relationships between epistemic emotions and learning engagement in a live-streaming classroom.

Feeling confident about your wrong answer: The role of feedback in the arousal of epistemic emotions
Keywords: Emotion and Affect, Metacognition, Problem Solving, Reasoning
Presenting Author: Katerina Nerantzaki, Aristotle University of Thessaloniki, Greece; **Co-Author:**Paraskevi Stergiadou, Aristotle University of Thessaloniki, Greece; **Co-Author:**Panayiota Metallidou, Aristotle University of Thessaloniki, Greece

How do we feel when we are confident that we answered correctly in a task but are informed that the answer is wrong? This study aims to provide empirical evidence for affective reactions following different types of feedback received after providing a biased heuristic solution, in an attempt to better understand our affective reactions when processing external feedback that conflicts with our cognitive schemas and biased judgments. Decision-making tasks that tend to activate biased heuristic solutions were used as epistemic emotion-elicited situations after receiving feedback for the correct answer. Self-reported epistemic emotions of surprise, confusion and curiosity were used as an affective reaction measurement. The sample consisted of 595 undergraduate and postgraduate university students. Performance in each task was followed by two types of feedback: a "*low informative*", namely if the answer is correct or not, and a "*high informative*", in which a detailed justification of the correct answer was provided by presenting the logical principle underlying the correct answer. Epistemic emotions were reported immediately after each type of feedback. The main effects of feedback type and performance were found to be significant in all cases. There was a significant decrease in epistemic emotions after receiving highly informative feedback, especially in the case of confusion for those who gave biased heuristic answers. The results extended previous evidence by showing the value of informative feedback for diminishing emotions caused by unexpected information that is incongruent with previous knowledge or cognitive schemas. Direction for future research and educational implications will be discussed.

Session T 19

26 August 2023 14:45 - 16:15
UOM_R05
Single Paper
Learning and Instructional Technology

Assessment and Tool Development in Early Childhood Education

Keywords: Assessment Methods, Early Childhood Education, Educational Technologies, Multicultural Education, Teacher Professional Development, Tool Development
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Avi Kaplan, Temple University, United States

The East Asia-Pacific Early Child Development Scales: A Longitudinal Validation Study in China
Keywords: Assessment Methods, Early Childhood Education, Multicultural Education, Tool Development
Presenting Author: Stephanie Wing Yan Chan, The University of Hong Kong, Hong Kong; **Co-Author:**Yufen Su, The University of Hong Kong, Hong Kong; **Co-Author:**Nirmala Rao, The University of Hong Kong, Hong Kong

The significance of early childhood development is reflected in United Nations Sustainable Development Goal (SDG) Target 4.2, which states that all children should have access to quality early education services to be ready for primary education. SDG Target Indicator 4.2.1 concerns the proportion of children aged 24 to 59 months who are developmentally on track in health, learning, and psychosocial well-being. It is critical to have psychometrically robust tools to track progress towards Target Indicator 4.2.1 in low- and middle-income countries, wherein a large proportion of young children are not reaching their developmental potential. This study examined the test-retest reliability and predictive validity of the East Asia-Pacific Early Child Development Scales Short Form, EAP-

ECDS(SF). A total of 709 children in Kindergarten Level 2 (K2: M_{age} = 57.85 months, *SD* = 4.77) were randomly selected from 29 kindergartens in Shanghai municipality and Guizhou province of China. Children were assessed using the EAP-ECDS(SF) in K2 and K3. School readiness was assessed in K3 (*n* = 538), and literacy and mathematics were assessed in Grade 2 (*n* = 316). Pearson's correlation coefficient and intraclass correlation coefficient (ICC = 0.73) indicated that the tool had good test-retest reliability across K2 and K3. Regarding predictive validity, K2 EAP-ECDS predicted K3 school readiness (β = 0.26), Grade 2 language and literacy (β = 0.18) and mathematics (β = 0.22) after adjusting for age, gender, socioeconomic status, and region. Findings support using the tool to measure holistic development of preschool-aged children in China and the region.

Cross-cultural measurement invariance of the early childhood development assessment tool FREDI 0-3
Keywords: Assessment Methods, Early Childhood Education, Multicultural Education, Tool Development
Presenting Author: Nadine Doennecke, University of Hildesheim, Institute of Educational Science, Germany; **Co-Author:**Janin Brandenburg, TU Dortmund University, Germany; **Co-Author:**Claudia Maehler, University of Hildesheim, Germany

Development tests are widely used in the scope of cross-cultural and comparative research to support intervention studies and health care projects concerning early childhood development. Therefore, it is crucial to use culturally sensitive and fair assessment tools. A culturally adapted version of the German development test FREDI 0-3 was used to assess a German (*n* = 405) and an Indian (*n* = 2075) sample of children between ten and thirty-two months. Measurement invariance indicates psychometric equivalence of a construct across groups and is a prerequisite for test applications in a cross-cultural setting. Confirmatory factor analyses for single cohorts per age group and multi-group measurement invariance analyses were used to examine the data equivalence of the test across groups. Weak measurement invariance could be established across both groups in all four age groups (10-14; 15-21; 22-26; 27-32 months) suggesting that the development factor was measured in the same way in both groups and accounted similarly for performance differences in the developmental subdomains for the German and the Indian sample. However, scalar and strict measurement invariance were violated in almost all group comparisons suggesting differences in scale difficulty and reliability across the German and the Indian sample. This suggests that a culture-sensitive adaptation process is necessary in order to create a culturally fair development test. It is recommended to always carry out measurement invariance testing to determine the psychometric equivalence of the test. If in doubt of the equivalence of data a locally developed assessment tool should be used.

Test-fairness assessing executive functions in preschoolers from Germany and Hongkong
Keywords: Assessment Methods, Early Childhood Education, Multicultural Education, Tool Development
Presenting Author: Claudia Maehler, University of Hildesheim, Germany; **Co-Author:**Katharina Schirmbeck, University of Hildesheim, Germany; **Co-Author:**Stephanie Wing Yan Chan, The University of Hong Kong, Hong Kong; **Co-Author:**Nirmala Rao, The University of Hong Kong, Hong Kong

While an emerging body of research has documented cross-cultural differences in executive functions (EF) development in the early years, few studies have provided evidence that the tasks used to assess EF show measurement equivalence across cultures. The current study is one of the first to explicitly test for measurement invariance of EF tasks across different cultural contexts at preschool age. Three EF tasks, each designed to assess a specific domain of EF, namely working memory (Object Span task), inhibitory control (child-friendly Stroop task), and cognitive flexibility (Dimension Change Card Sort), were administered to *N* = 193 3- to 6-year-olds from Hong Kong and Germany. We compared the goodness-of-fit of three theory-driven EF factor structure models (one-factor-model, two-factor-model, and three-factor-model) individually for each of the two contexts as well as for the full sample. The three-factor model, comprising of separate but correlated latent factors, across the full sample yielded the best fit. We then tested for measurement invariance of this best fitting model across the full sample. The results of multigroup confirmatory factor analyses show that the identified factor model reaches strong measurement invariance. These findings suggest that EF assessment at preschool age is likely equivalent across the subsamples from Hong Kong and Germany. The importance of test-fairness in cross-cultural research is discussed.

Digital Competence in Kindergarten: Adopting the DigCompEduSAT for Kindergarten Teachers
Keywords: Early Childhood Education, Educational Technologies, Teacher Professional Development, Tool Development
Presenting Author: Attila Rausch, ELTE Eötvös Loránd University, Budapest, Hungary

Technological development in education affects kindergarten and brings several new opportunities and challenges to early childhood education (Magen-Nagar & Firstater, 2019). The use of digital technology is more frequent in early childhood education as well, and there is growing attention on the successful and effective integration of these tools in everyday practice. While research suggests that kindergarten teachers are the most important actors in applying digital technology in kindergartens, we know little about their digital competence.We aimed to adapt the DigCompEdu self-assessment tool (Ghomi & Redecker, 2019) and inspected its psychometric properties to explore its usability in kindergarten. Our instrument contained 21 questions of the original DigCompEduSAT modified for early childhood education, regarding 6 areas of digital competence of educators. Overall, 242 kindergarten teachers participated from Hungarian kindergartens selected by systematic random sampling. Reliability (Cronbach's alpha=.894) and construct validity (CFI=.956) of the instrument proved to be good. Kindergarten teachers' average score was 31.2 %p (SD=14.3 %p), they reached higher scores on the professional engagement subscale (M=48.1 %p, SD=20.3 %p), but they have room to improve on facilitating children's technology use (M=18.7 %p, SD=19.1 %p). Considering the limitations of self-assessments, this can be a helpful instrument to survey and develop teachers' digital competence in kindergarten. Our research also showed that parallel to equipping kindergartens with digital technology, improving early childhood educators' digital competence needs more attention in the future.

Session T 20

26 August 2023 14:45 - 16:15
UOM_R08
Single Paper
Learning and Social Interaction, Lifelong Learning, Teaching and Teacher Education

Informal Lifelong Learning

Keywords: Computer-assisted Learning, Feedback, In-service Teachers, Informal Learning, Lifelong Learning, Meta-analysis, Metacognition, Qualitative Methods, Quantitative Methods, Teacher Professional Development
Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development
Chairperson: Kati Vasalampi, University of Jyväskylä, Finland

Practices of technology-enhanced informal workplace learning in knowledge work
Keywords: Computer-assisted Learning, Informal Learning, Lifelong Learning, Qualitative Methods
Presenting Author: Anne Karhapää, University of Jyväskylä, Finland; **Co-Author:**Raija Hämäläinen, University of Jyväskylä, Finland; **Co-Author:**Johanna Pöysä-Tarhonen, University of Jyväskylä, Finland

Informal learning is an essential part of workplace learning. Digital technology can play a significant role in enabling informal learning at work with various tools and resources. However, there is still little empirical research on informal learning in this context and therefore knowledge about technology-mediated learning processes is needed. This study uses digital ethnography to investigate informal learning in authentic work settings. The data was collected from one public-sector workplace during the years 2020-2022, including observations, interviews, and diaries, and was analysed using qualitative content analysis. The current paper applies practice theories to investigate how the practices of technology-mediated work support informal learning and how these practices are formed in people's daily activities and speech, in social and material environment of digital technology and work. The results demonstrate how inseparable part of work and learning digital technology is and how technology-mediated work practices foster informal learning. The detailed accounts of these practices provide new understanding of how technology is used for informal learning in authentic work settings.

Pop Bands' Practice: Goal Setting, Monitoring and Feedback Seeking
Keywords: Feedback, Informal Learning, Metacognition, Qualitative Methods

Presenting Author: Simon Schmidt, Universität Regensburg, Germany; **Co-Author:**Helen Jossberger, University of Regensburg, Germany; **Co-Author:**Hans Gruber, University of Regensburg, Germany

The level of music performance is a result of demanding practice processes, especially deliberate practice. Within pop bands several musicians join forces and perform together. Thus, individual practice processes as well as collective practice processes play an essential role in advancing accomplishments. Important aspects in both individual and collective practice processes are setting appropriate goals, monitoring one's own performance, and seeking feedback from others. It is not yet clear, however, how these aspects of practice are shaped and implemented in pop bands of different professional levels. To gain a detailed understanding about practice within pop bands, a qualitative interview study with six professional and six semi-professional music bands was conducted. Demographic data was used to divide participating bands into both groups. Data on aspects of individual practice and collective practice were collected through semi-structured interviews. First results indicate that professionals aimed to establish themselves in the field, while semi-professionals strived to expand their popularity. Moreover, professionals reported more conscious monitoring strategies and sought feedback from more external sources than semi-professionals. At the conference, further results should draw a detailed picture of the similarities and differences between professional and semi-professional pop bands.

The Relationships between Job Insecurity and Informal Learning in Finance – A survey study
Keywords: Feedback, Informal Learning, Lifelong Learning, Quantitative Methods
Presenting Author: Patrick Beer, University of Regensburg, Germany; **Co-Author:**Sandra Bauhofer, University of Regensburg, Germany; **Co-Author:**Regina Mulder, University of Regensburg, Germany

Advancing digitalisation as well as economic crises induce a feeling of job insecurity among employees in the form of concerns about one's own work-related future. To handle these concerns in an agentic and effective manner, engaging in informal learning is important. There is however little evidence on how job insecurity might affect informal learning. Therefore, the research question is: *What are the effects of perceived job insecurity on informal learning?*Based on the Conservation of Resources Theory, the hypothesis is that an increase in job insecurity is related to a decrease in informal learning.To answer the research question, a cross sectional survey study with employees from full-service banks in Germany was conducted (N=195). The questionnaire contained measures for various forms of job insecurity (i.e. quantitative job insecurity, qualitative job insecurity, techno-uncertainty) as well as various informal learning activities (i.e. feedback-seeking, help-seeking, information-seeking, reflection). Stepwise regression analyses were conducted.Preliminary results indicate that quantitative job insecurity (i.e. the fear of losing one's job) is not a predictor for informal learning, while qualitative job insecurity (i.e. the fear of a change in central features of one's job) has a significant negative relationship with informal learning. Additional analyses on the relationships between the different forms of job insecurity and the different informal learning activities will be highlighted and discussed before theoretical and domain-specific practical implications will be derived.

Factors related to Teachers' innovative behavior: a multilevel meta-analysis
Keywords: In-service Teachers, Informal Learning, Meta-analysis, Teacher Professional Development
Presenting Author: Stefan Robbers, Open University Netherlands, Netherlands; **Co-Author:**Arnoud Evers, Open Universiteit Nederland, Netherlands; **Co-Author:**Marjan Vermeulen, Heerlen Open Universiteit, Netherlands

In today's society, teachers are increasingly expected to respond to various new developments. This requires a high degree of innovative behavior (IB) of teachers, which is described as generating, promoting and realizing new ideas on one's own initiative. The antecedents of IB are increasingly discussed in scientific literature, however, these antecedents seem to be randomly selected without an underlying research agenda or model. The current meta-analysis aims to cluster these studies and their underlying variables and establish an aggregated effect size in relation to IB. To include as many measurements as possible, multilevel meta-analysis was applied at three hierarchical levels. The results showed that individual factors were moderately associated with IB, and organizational factors were weakly associated. Within organizational factors, the strongest relationships were found for the cluster of social capital theory. However, social capital theory has not been explicitly addressed in any of the publications analyzed in the present meta-analysis. The applicability of this theory in relation to IB confirms our research agenda, namely that IB should be further examined in relation to larger overarching theories.

Session T 21

26 August 2023 14:45 - 16:15
AUTH_T002
Single Paper
Developmental Aspects of Instruction, Instructional Design, Teaching and Teacher Education

Conceptual Change and Teaching

Keywords: Cognitive Development, Conceptual Change, Instructional Design, Mathematics/Numeracy, Misconceptions, School Leadership, Teacher Efficacy, Teacher Professional Development, Teaching Approaches
Interest group: SIG 03 - Conceptual Change, SIG 14 - Learning and Professional Development
Chairperson: Jan-Mikael Rybicki, Aalto University, Finland

Intent and relationality in middle leading practices of facilitation, mentoring and coaching
Keywords: Conceptual Change, School Leadership, Teacher Efficacy, Teacher Professional Development
Presenting Author: Christine Edwards-Groves, Griffith University, Australia; **Co-Author:**Catherine Attard, University of Western Sydney, Australia; **Co-Author:**Sharon TIndall-Ford, University of Wollongong, Australia; **Co-Author:**Peter Grootenboer, Griffith University, Australia

Amidst increasing acknowledgement across the world that the work of middle leaders is critical for improving teaching practices in schools, less empirical evidence exists about their specific leading practices compared to, for example, principal leadership (Grootenboer, Edwards-Groves & Rönnerman, 2020; Harris, 2014). Coupled with the complexity of the dual responsibilities of teaching and leading instructional development that middle leaders undertake in schools, evidence delineating and describing the specific dimensions of their leading practice is scant. Studies to date have established that more focused research is required to investigate the distinctiveness of middle leaders' practices (Harris et al., 2019; Lipscombe et al., 2019). Drawing on practice theory, this paper presents preliminary results from the first phase of a three-year project examining the 'flow of influence' of middle leading practices on teacher development and student learning. Thematic analysis of interviews with 32 middle leaders reveals that the practices of facilitating, mentoring and coaching are nuanced and distinctive in their intent and relationality in school-based education development. A critical exploration of the multidimensionality of middle leading as elicited by participants in detailed descriptions of their day-to-day leading practices is presented. It is argued that the common and interchangeable usage of these terms in policy obscures and threatens to erase, or blur at best, the important distinctions between these facets of middle leading work. Results have important implications that cannot be ignored by school leaders and policy makers seeking to improve broader systemic support for building and refining middle-leading practices in schools.

Implementing conceptual change principles for mathematics instruction: the case of fraction division
Keywords: Conceptual Change, Instructional Design, Mathematics/Numeracy, Teaching Approaches
Presenting Author: Ioanna Koptsi, University of Ioannina, Greece, Greece; **Co-Author:**Konstantinos Christou, Aristotle University of Thessaloniki, Greece; **Co-Author:**Xenia Vamvakoussi, University of Ioannina, Greece

A major source of difficulty in rational number learning is that students over-rely on their prior knowledge of natural numbers to make meaning of rational numbers and their operations. The dominant meaning of division in natural number contexts (i.e., equi-partitioning) does not generalize for fraction division. In addition, an efficient algorithm for fraction division aka "invert and multiply" is obscure for students. Thus, students face conceptual as well as procedural difficulties with fraction division. We present the rationale and insights from the first enactment of an ongoing topic-specific design research study aiming at supporting students to make sense of fraction division and the "invert and multiply" algorithm. We drew on conceptual change principles for instruction,

specifically a) search and enhance prior knowledge that can be employed productively, and b) use appropriate analogies to facilitate knowledge transfer from a more to a less familiar domain. We invested on the measurement meaning of division that is transferable to rational numbers; and designed an instructional sequence building on systematic cross-domain mapping between length measurement and division. This allowed for explaining the “invert and multiply” algorithm as analogous to the “compensation principle” in measurement. We enacted this sequence with four 6th graders who were pre-and post-tested regarding their understandings of fraction division. We found that the intervention promoted substantially their competences in interpreting division as measurement, and in applying and explaining the “invert and multiply” algorithm. We discuss key insights from the first enactment that will inform the re-design of the instructional sequence.

An intervention with erroneous examples to address misconceptions on equations and inequalities
Keywords: Cognitive Development, Conceptual Change, Mathematics/Numeracy, Misconceptions
Presenting Author: Eleni Karagiannidou, Aristotle University of Thessaloniki, Greece; **Co-Author:**Courtney Pollack, Harvard University, United States; **Co-Author:**Konstantinos Christou, Aristotle University of Thessaloniki, Greece

Equations and inequalities, core concepts in algebra, are difficult for students to understand. Students may make mistakes and hold misconceptions because of their prior knowledge about arithmetic and about algebraic notation. This study investigated the hypothesis that errors in equations and inequalities may be due to students’ tendency to consider variables as symbols that represent only natural numbers and to misinterpret the phenomenal sign of the algebraic expressions that appear in the equations/inequalities as the real sign of the values they can represent (i.e., phenomenal sign misconception- PSM). Also, this study tested whether a teaching intervention with erroneous examples could help students resolve mistakes and misconceptions better than an intervention with correctly solved examples. The participants were 119 9th grade students. Students completed Pre-, Post- and Retention tests, which asked whether there are solutions for nine equations and nine inequalities in each test, and to present the possible solutions. The equations and inequalities were designed so that a PSM would produce specific mistakes. The Experimental Group (44 students) saw 4 erroneous examples and the Control Group (65 students) saw correctly solved examples that included inequality tasks. The results showed that PSM and students´ tendency to associate variables only with natural numbers negatively affected their performance in the tests. Both the teaching intervention with erroneous examples and with solved examples were equally effective in helping students address part of their misconceptions. This finding raises theoretical issues about the effectiveness of erroneous examples which will be discussed.

Session T 22

26 August 2023 14:45 - 16:15
UOM_A09
ICT Demonstration
Motivational, Social and Affective Processes

Effort Tracking: Using Teacher and Student Ratings of Students’ Effort in Goal-Setting Conversations

Keywords: Digital Literacy and Learning, Learning Analytics, Motivation, Secondary Education
Interest group: SIG 27 - Online Measures of Learning Processes

Please bring your own device if you are attending this ICT demonstration.Recent research has identified students’ effort as a potent and malleable focus for improving academic and other outcomes, in students of all abilities. However, measuring students’ academic effort is often conducted using ad hoc approaches in schools (typically allocating single grades rated by teachers) that are subject to reference (as well as other forms of) bias. Studies employing both teacher- and student-ratings of students’ effort have shown there to be generally low correlations between these two perspectives, however student-perceptions and teacher-perceptions provide unique and complementary insights into students’ effort. This presentation demonstrates a tool (Effort Tracking) used for measuring tripartite effort (with operative, cognitive, and social-emotional dimensions) from both student and teacher perspectives, used in Australian Independent schools over the past five years and now being trialled in the United States. Demonstrations will show how data is collected via a novel user interface and how it is displayed longitudinally on dynamic student dashboards to improve intrinsic motivation for learning. Participants will take part in a hands-on activity, exploring real (anonymised) effort data, to discover how it can be used to distinguish student profiles and to better ‘know all students,’ informing formative goal-setting conversations in students of all abilities.

Effort Tracking: Using Teacher and Student Ratings of Students’ Effort in Goal-Setting Conversations
Presenting Author: Robin Nagy, UNSW, Australia

Please bring your own device if you are attending this ICT demonstration.Recent research has identified students’ effort as a potent and malleable focus for improving academic and other outcomes, in students of all abilities. However, measuring students’ academic effort is often conducted using ad hoc approaches in schools (typically allocating single grades rated by teachers) that are subject to reference (as well as other forms of) bias. Studies employing both teacher- and student-ratings of students’ effort have shown there to be generally low correlations between these two perspectives, however student-perceptions and teacher-perceptions provide unique and complementary insights into students’ effort. This presentation demonstrates a tool (Effort Tracking) used for measuring tripartite effort (with operative, cognitive, and social-emotional dimensions) from both student and teacher perspectives, used in Australian Independent schools over the past five years and now being trialled in the United States. Demonstrations will show how data is collected via a novel user interface and how it is displayed longitudinally on dynamic student dashboards to improve intrinsic motivation for learning. Participants will take part in a hands-on activity, exploring real (anonymised) effort data, to discover how it can be used to distinguish student profiles and to better ‘know all students,’ informing formative goal-setting conversations in students of all abilities.

Session T 23

26 August 2023 14:45 - 16:15
UOM_A10
ICT Demonstration
Learning and Instructional Technology

Making SPAGEO City, the interactive design of a virtual environment for training spatial skills

Keywords: Computer-assisted Learning, Educational Technologies, Game-based Learning, Tool Development
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Please bring your own device if you are attending this ICT demonstration.In this ICT demonstration we will present SPAGEO City, a virtual environment (VE) developed as a support for teaching activities in a didactical engineering study on spatial orientation for students of grades 2-4 (aged 7 to 10). The application’s developer and the didactics of mathematics team (DiMaGe) will demonstrate the application’s features. They will also explain how the project’s evolving didactical engineering needs and continuous user observations in classroom environments lead to multiple prototypes and defined the tool’s design choices. This process enabled us to identify best practices we believe can be useful when planning, designing, and building computer-assisted learning tools with the same purpose. This demonstration is offered alongside a workshop in which participants will experience first-hand some of the teaching activities designed by the didactics of mathematics team working in SPAGEO. Participation in the workshop is not required for this demonstration.

Making SPAGEO City, the interactive design of a virtual environment for training spatial skills
Presenting Author: Fatou-Maty Diouf, University of Geneva, Switzerland; **Co-Author:**Sabrina Matri, University of Geneva, Switzerland; **Co-Author:**Jean-Luc Dorier, University of Geneva, Switzerland

Please bring your own device if you are attending this ICT demonstration.In this ICT demonstration we will present SPAGEO City, a virtual environment (VE)

developed as a support for teaching activities in a didactical engineering study on spatial orientation for students of grades 2-4 (aged 7 to 10). The application's developer and the didactics of mathematics team (DiMaGe) will demonstrate the application's features. They will also explain how the project's evolving didactical engineering needs and continuous user observations in classroom environments lead to multiple prototypes and defined the tool's design choices. This process enabled us to identify best practices we believe can be useful when planning, designing, and building computer-assisted learning tools with the same purpose. This demonstration is offered alongside a workshop in which participants will experience first-hand some of the teaching activities designed by the didactics of mathematics team working in SPAGEO. Participation in the workshop is not required for this demonstration.

Session U 1

26 August 2023 16:30 - 18:00
UOM_CH
Invited Symposium
Assessment and Evaluation

More than just noise? New insights on heterogeneity in students' perceptions of instruction

Keywords: Achievement, Classroom Assessment, Classroom Management, Instructional Design, Large-scale Assessment, Social Aspects of Learning and Teaching, Teacher Effectiveness, Teaching Approaches, Teaching/Instructional Strategies
Interest group:
Chairperson: Lisa Bardach, University of Tübingen, Germany
Organiser: Lisa Bardach, University of Tübingen, Germany
Organiser: Sebastian Röhl, University of Tübingen, Germany
Discussant: Jonathan Schweig, United States

Even though students in the same class are exposed to the same teacher, they can differ considerably in their perception of their teacher's instruction. This heterogeneity has been largely ignored by prior research and in practical applications as they typically use class-level aggregates (i.e., the mean of the ratings of all students in a class) and treat heterogeneity in students' perceptions as "noise". Our EARLI Emerging Fieldgroup and the present symposium aim to advance current understandings of heterogeneity by focusing on its sources, implications, and new integrative perspectives. Röhl and Bardach demonstrate that heterogeneity in students' perceptions of instruction arises for substantial reasons as it indicates whether teachers manage to adapt instruction to the needs of individual students within classes. Prast et al. add to this by shedding light on differentiated instruction from students' perspective. Neuendorf et al. contribute to the knowledge of potential sources of heterogeneity by testing whether teachers' diagnostic competences predict heterogeneity in students' ratings of instruction. Lastly, Davison et al. adopt an intraindividual approach to explore the issue of within-group heterogeneity and present findings from multi-level analyses focusing on teacher involvement. Jonathan Schweig, our discussant, will integrate the four studies, and outline promising directions for future research and potential implications for practice.

Heterogeneity in students' perception of instruction is a marker of non-adaptive teaching
Presenting Author: Sebastian Röhl, University of Tubingen, Germany; **Co-Author:**Lisa Bardach, University of Tübingen, Germany

Students in the same class can vary greatly in their perceptions of the same teacher; however, the current understanding of heterogeneity in students' perceptions of instruction, and its sources and implications remains limited. Here, we propose that heterogeneity in students' ratings of instruction may serve as a marker of non-adaptive teaching: If students in the same class feel equally supported and experience that the teacher adapts instruction to their needs and learning prerequisites, then heterogeneity should be low. By contrast, if the teacher fails to provide tailored instruction to individual students, heterogeneity in students' perceptions of instruction within classes should increase. Using latent change score modelling, we analyzed data from the TALIS GTI survey (N = 19659 students and their N = 679 mathematics teachers). It was tested whether an increase in adaptive teaching predicts changes in heterogeneity in students' perceptions of teaching quality (clarity of instruction, cognitive engagement, support for autonomy, and teacher's classroom management) within classrooms. Results showed that for most teaching quality dimensions, students in classrooms with higher levels of adaptive teaching (as rated by students) had less heterogenous perceptions of teaching quality. No significant effects were found for teacher-rated adaptive teaching. Overall, this study notably adds to the body of knowledge on heterogeneity in students' perceptions of instruction and holds important implications for educational practice.

Differentiated instruction from students' perspective in mathematics lessons
Presenting Author: Emilie Prast, Leiden University, Netherlands; **Co-Author:**Marieke van Geel, University of Twente, Netherlands; **Co-Author:**Trynke Keuning, Hogeschool KPZ, Netherlands; **Co-Author:**Hans Luyten, University of Twente, Netherlands

Differentiated instruction concerns adapting education to students' needs. However, relatively little is known about how students experience the degree to which their teachers fulfill their individual educational needs. In the current study, the Differentiated Instruction from Students' Perspective (DISP) questionnaire was developed and administered among 458 students of grade 4 to 6 of 22 primary school teachers in the Netherlands. The internal consistency of the DISP instrument was considered good. Students in general were moderately positive about the level of differentiation they experienced and few differences between DISP-ratings of students with varying mathematics achievement levels were identified. It is concluded that the DISP questionnaire is a suitable instrument to study students' perspectives and can be used by researchers as well as by teachers who would like to gain insights in and improve their differentiation practice.

Heterogeneity in instructional quality perceptions as indicator of teachers' diagnostic competence?
Presenting Author: Marko Lüftenegger, University of Vienna, Austria; **Co-Author:**Claudia Neuendorf, Hector Institute for Education Research and Psychology, Tübingen University, Germany; **Co-Author:**Joy Muth, University of Vienna, Austria; **Co-Author:**Kou Murayama, University of Tübingen, Germany

Students' perceptions of teachers' instructional practices are an important source for understanding why classroom environments are effective. Students in the same classroom, however, can differ considerably in their perceptions of instructional quality, but our knowledge about factors that shape this heterogeneity is rather limited. Especially teacher-related factors such as teachers' diagnostic competence have remained largely unexplored. Using a longitudinal design with two waves, the present study seeks to improve our understanding of what drives heterogeneity in students' perceptions of instructional quality by investigating the role of teachers' diagnostic competence. We used data from 1678 eleventh grade students (60% female, mean age = 17.02, SD = .79) from 97 English language classrooms. We measured instructional quality using the three generic basic dimensions classroom management, student support and cognitive activation. Using latent multilevel models, we found that the more students perceived that their teachers knew about their achievement and learning behavior, the more they shared perceptions of their teachers' classroom management. Unexpectedly, no such effects were found for cognitive activation and student support. The level of teachers' diagnostic competence was also not predictive of at least short-term changes in heterogeneity in students' perception of instructional quality. Our study provides further evidence for our limited understanding of the factors involved in driving students' variability in classroom perceptions of instructional quality.

Teacher involvement and help seeking: An intraindividual approach to within-group heterogeneity
Presenting Author: Kyle Davison, University of Oxford, United Kingdom; **Co-Author:**Lars-Erik Malmberg, University of Oxford, United Kingdom; **Co-Author:**Kathy Sylva, University of Oxford, United Kingdom

Using the example of teacher involvement and academic help-seeking behaviour, we discuss how investigating within-group heterogeneity may help researchers to understand within-learner processes that can be stable or variable over time. Help seeking is an important learning strategy involving an interaction between two-or-more individuals. These interactions occur within the context of interpersonal relationships, and research suggests that the decision to seek or avoid necessary help is particularly susceptible to social factors, including the type of personal involvement learners have with their teachers. In our presentation, we go beyond the literature by examining the heterogeneity of student perceptions of teacher involvement and the extent to which these perceptions are associated with students' help-seeking behaviour from one lesson to the next. Our study is situated in N = 12 English primary school classrooms across three schools. Data consists of 6,592 task-specific reports. N = 290 students in Years 4-6 (aged 8.22 to 11.48) reported on their need for help and help-

seeking behaviour at the end of each lesson, across 13 school subjects, for two weeks. Teacher involvement was measured using both student and teacher reports at a single time-point at the beginning of the study. We will present findings from the ongoing multilevel analyses and reflect on the strengths and limitations of adopting an intraindividual approach to the issue of within-group heterogeneity.

Session U 2

26 August 2023 16:30 - 18:00
AUTH_DC1
Symposium
Motivational, Social and Affective Processes

Multimodal approaches with measures of physiological arousal in education

Keywords: Cooperative/Collaborative Learning, Educational Technologies, Emotion and Affect, Feedback, Health-care Education, Peer Interaction, Primary Education, Problem Solving, Secondary Education, Self-regulated Learning and Behaviour, Simulation-based Learning, Social Interaction
Interest group: SIG 27 - Online Measures of Learning Processes
Chairperson: Inge Molenaar, Radboud University Nijmegen, Netherlands
Organiser: Anne Horvers, Radboud University Nijmegen, Netherlands
Discussant: Lars-Erik Malmberg, University of Oxford, United Kingdom

The measurement of physiological arousal in education has become easier over the last year due to the rise of higher-quality wearable devices that measure electrodermal activity (EDA) or skin conductance (Posada-Quintero & Chon, 2020). These novel opportunities to measure unconscious bodily variations have the potential to add to important constructs, such as emotions, collaborative learning, and self-regulated learning (Azevedo et al., 2018; Fang et al., 2018; Malmberg et al., 2019). So far, most previous research has used unimodal approaches. However, multimodal approaches combining physiological arousal with self-reports and observations seem promising (Harley et al., 2015; Horvers et al., 2021). This symposium combines four contributions that have multimodal approaches with measures of physiological arousal. These papers describe novel ways to address physiological arousal by applying new analysis methods to triangulate multimodal data streams that measure important constructs during learning. The first paper combined physiological arousal with behavioural, SRL and group-regulated learning codes in a collaborative learning setting. The second paper investigated which socio-emotional interaction profiles can be identified in students in a collaborative learning setting. They combined physiological arousal with video observations and self-reports. The third paper focused on the connection between physiological synchrony in a collaborative setting by combining physiological arousal with coding of interpersonal behaviour. The fourth paper investigated emotional responses to immediate feedback by combining physiological arousal with self-reports and observations of facial expressions. This symposium makes a significant contribution to the rising field of addressing essential constructs in learning with physiological arousal combined with multimodal data streams.

Analyzing Multimodal Data to Understand Trainees' Regulation Strategies in Simulation Scenarios
Presenting Author: Matthew Moreno, McGill University, Canada; **Co-Author:**Lucia Patino, McGill University, Canada; **Co-Author:**Keerat Grewal, McGill University, Canada; **Co-Author:**Sayed Azher, McGill University, Canada; **Co-Author:**Jason Harley, McGill University, Canada

Self-regulated learning (SRL) skills are needed to help ensure that learners can be autonomous masters of their own learning and have the skills needed to reach their potential (Hadwin & Järvelä, 2011; Jarvela & Hadwin, 2013). Group regulated learning (GRL) is the ability of groups to collectively regulate their own learning which is required for teams to learn, make decisions, and regulate their behaviors (Hadwin & Oshige, 2011). Medical simulations allow trainees to work as teams to develop their SRL and GRL skills (Bransen et al., 2022) to better prepare medical trainees for the challenges faced in clinical practice. Questions remain about how medical trainees' behaviors, group regulation strategies, and physiological responses vary while they participate in a medical simulation and what indicators multimodal data channels provide concerning the success of groups' regulation strategies. Using a mixed methods convergence design incorporating multi-modal data (Azevedo & Gašević, 2019) including behavioural, SRL and GRL codes, and electrodermal activity, researchers studied fourteen (N= 14), 1st to 3rd-year medical residents as they engaged in high-fidelity simulation scenarios. Results suggest that psychophysiological responses increase as simulations progress, in conjunction with an increase in group-regulated learning strategies to manage the effective delivery of patient care from initial contact through to delivering critical procedures. These results provide steps to advance the use of a group-regulation based framework with multi-modal data, to understanding of how medical trainees develop group-based approaches to performance in simulation scenarios.

How students' socio-emotional interaction profiles emerge in collaborative learning
Presenting Author: Tiina Susanna Törmänen, University of Oulu, Finland; **Co-Author:**Mohammed Saqr, University of Eastern Finland, Finland; **Co-Author:**Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:**Jonna Malmberg, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland

Research has shown individual differences in how students experience emotions in learning situations. Prior studies have, for example, focused on situational emotional expressions in different learning settings, including socio-emotional interactions in collaborative learning. What is yet to be studied is what are the emotional and social aspects in collaborative learning that influence these situational emotional expressions, and furthermore, how these aspects relate to the formation of the students' socio-emotional interaction profile in the long run. To this end, this study aims to investigate why a student adopts a certain socio-emotional interaction profile during a four-lesson collaborative science learning period. Multimodal data (video observations, physiological arousal, self-reported appraisals of social and emotional aspects of collaboration) together with mixture hidden Markov models (MHMM) are used to identify secondary school students (n = 54, 18 groups) socio-emotional interaction profiles. Furthermore, relevant covariates are examined to search explanations for students' profile memberships. The results revealed three socio-emotional interaction profiles (negative, diverse, neutral). Strikingly, students' individual appraisals of social and emotional aspects of collaboration were not significant predictors of the profile membership. Instead, the interaction of the students' group members during the learning process seemed to make a difference: the valence of their socio-emotional interaction was a significant predictor of the profile membership. The findings demonstrate how emotions are constructed together in groups' socio-emotional interactions highlighting the social dimension of situational emotional reactions. The findings support the implementation of multimodal process data in unpacking students' emotional experiences in collaborative learning.

Physiological Synchrony in Interpersonal Agency: A Case Study on Collaborative Problem Solving
Presenting Author: Reito Visajaani Salonen, Helsinki Institute for Social Sciences and Humanities, University of Helsinki, Finland; **Co-Author:**Eeva Haataja, University of Helsinki, Finland; **Co-Author:**Esther Chan, University of Melbourne, Australia; **Co-Author:**Chase Sherwell, University of Queensland, Australia; **Co-Author:**Ross Cunnington, University of Queensland, Australia

Educational sciences are adapting different technologies to classroom research and collaborative work situations. Rapidly developing gadgets designed to measure physiological activity such as Heart rate or skin conductivity have eased access to human body reactions in real-life situations. Studies no more contain only technical results but also have a wider perspective to understand relations between results and theory. In our research, we used two novel approaches to understand connections between physical arousal and interpersonal behavior. Skin conductivity is a way to obtain physiological changes both reactive to situation (phasic), but also level of intensity and duration (tonic) during the situation. Skin conductivity is measured by Empatica E4 bracelet and combined with joystick analysis of video to estimate person IP, especially interpersonal agency during collaborative group work. This is a case study of 4 students working collaboratively during one lesson. Results indicate that students have reactive physiological arousal and students' agency has a connection to physiological reactions. In collaborative group work situation students have high physical synchrony and moments of distraction is able to detect. Interpersonal agency is maximal correlated to students' phasic and tonic EDA in window of physiological lag of 30 seconds. This maximum correlation weakens for situations of low collaboration and topic of discussion. Benefits of both EDA and IP CAID analysis leads to new analyzing methods to establish more information about the total process. Further studies with larger samples are required, but it is evident to say EDA and interpersonal agency have connections with each other.

Multimodal data streams to explore emotional responses to immediate feedback in young learners

Presenting Author: Anne Horvers, Radboud University Nijmegen, Netherlands; **Co-Author:**Ard Lazonder, Radboud University, Netherlands; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Tibor Bosse, Radboud University Nijmegen, Behavioural Science Institute, Netherlands

As technology is making its way into primary classrooms, young learners nowadays get feedback from both their teacher and the learning system. This feedback can elicit various emotional responses in students, depending on the correctness of their previous actions. Feedback on failure (FOF) often leads to negative emotions, although it can elicit positive emotions as well. The same mixed findings have been found for feedback on success (FOS). As emotions have a direct influence on student learning, it is important to gain more insight into the relationships between immediate feedback and emotional responses. Therefore, this study investigated fifth graders' emotional responses to immediate feedback provided by adaptive learning technologies (ALTs). A multimodal approach was used that combined physiological, experiential and behavioural responses to FOF and FOS. Physiological arousal was measured by electrodermal activity (EDA), experiential responses by self-reported valence and behavioural responses by observations of facial expressions. Preliminary results indicate that FOS elicits more above-threshold peaks in EDA than FOF, but first indicators of FOF eliciting higher EDA peaks are found. FOF elicited mostly negative emotions and FOS elicited mostly positive emotions This study provides opportunities for understanding the relations between multimodal data streams to measure emotional responses in a three-dimensional way, which in turn can be used to determine which of these are critical to measure emotions.

Session U 3

26 August 2023 16:30 - 18:00
UOM_CR
Symposium
Teaching and Teacher Education

Educating for democracy. Teaching and learning domain-specific reasoning to discuss social issues

Keywords: Reasoning, Secondary Education, Social Sciences and Humanities, Teaching/Instructional Strategies
Interest group: SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Carla Van Boxtel, University of Amsterdam, Netherlands
Organiser: Geerte Savenije, University of Amsterdam, Netherlands
Discussant: Gerhard Stoel, Radboud University, Nijmegen, Netherlands

Developing skills to examine, analyse and reason about social issues is considered important to support and develop a more robust, deliberative democracy. Scholars in the field of specific subjects, e.g. history, philosophy, geography and social sciences, often argue that fostering subject-specific skills is also relevant for democratic citizenship. However, it remains unclear whether and how teachers and students are able to apply subject-specific skills to reason about social issues. A recent report on civic reasoning (Lee et al., 2021) – i.e. to examine and discuss complex civic, political, and social issues – recommends further in-depth research on subject-specific elaborations for this type of reasoning. This is also in line with previous research on the relevance of subject-specific components of reasoning. This symposium brings together research in various subjects in the humanities and social sciences focusing on the teaching and learning of reasoning about social issues in subject-specific ways. The four contributions provide insight in the difficulties secondary school students encounter when using subject-specific skills to reason about social issues. Furthermore, it presents elaborated and evaluated design principles, teaching approaches and materials that teachers can use when aiming to stimulate students' reasoning about social issues. In line with the EARLI theme of 2023, the plenary discussion will reflect on how the presented educational materials and interventions contribute to students' ability to take their position in current social issues and help shape our future democracies. Lee, C. D., White, G., & Dong, D. (2021). *Educating for Civic Reasoning and Discourse* National Academy of Education.

Design principles and educative materials that can promote students' social scientific reasoning
Presenting Author: Thomas Klijnstra, University of Amsterdam, Netherlands

Social scientific reasoning is essential in social science education and for a democratic society as a whole. Students are challenged to analyze and reason about social issues such as social inequality, crime, and poverty. However, students experience difficulties in their social scientific reasoning. This study aims to develop and evaluate design principles and curriculum materials and activities that promote students' social scientific reasoning and that can help social science teachers to develop effective instruction. In this design-based research, teachers, informed by a conceptualization of social scientific reasoning and the identification of students' naïve ways of reasoning, and guided by researchers, developed materials and activities piloted in two classes and evaluated by three focus groups of teachers and students and student questionnaires. The participants were four social science teachers in The Netherlands and their students in eight 9^{th} and 10^{th} grades of senior secondary education classes in the two highest tracks preparing for college and university. This study resulted in (1) refined design principles for teaching students social scientific reasoning and; (2) authentic learning tasks to promote students' social scientific reasoning through explicit instruction, the use of video clips with explicit instruction on subskills and group activities with graphical organizers that can promote social scientific reasoning.

Teaching strategies for value-loaded critical reasoning in philosophical dialogues
Presenting Author: Geerte Savenije, University of Amsterdam, Netherlands; **Co-Author:**Floor Rombout, Utrecht University, Netherlands

In order to form a reasoned judgment about social issues, students need critical and moral reasoning skills. The concept *value-loaded critical reasoning* combines critical thinking, moral reasoning, and critical self-reflection. Researchers have emphasized the potential of classroom dialogue for teaching critical and moral reasoning skills (Bleazby, 2020) and previously, we have developed design principles for promoting value-loaded critical reasoning in classroom dialogues. The five design principles are: address, apply and reason critically about moral values, create intercontextuality, and promote meta-level reflection. The aim of the present study is to describe how secondary school philosophy teachers implement the design principles for promoting value-loaded critical reasoning in whole-class, teacher-led dialogues. We discuss the findings of two phases in an educational design study (Plomp & Nieveen, 2013). In the first phase, five secondary school philosophy teachers participated in five professional development meetings over the course of one school year. During this prototyping phase, the teachers learned about design principles, collaboratively developed teaching strategies and evaluated the implementation thereof. We qualitatively analyzed recordings of the classroom dialogues, which resulted in a practical list of teaching strategies for each design principle. However, we observed very few teaching strategies for the design principle about promoting meta-level reflection. Therefore, we consequently analyzed classroom dialogues that were recorded in the evaluation phase of our educational design study (N=6 teachers). Similar qualitative analyses resulted in a framework of teaching strategies for promoting metalevel reflection during value-loaded critical classroom dialogues.

Advancing students' reasoning about democracy: A project on social and political trust
Presenting Author: Maria Jansson, Örebro University, Sweden; **Presenting Author:**Johan Sandahl, Stockholm University, Sweden; **Co-Author:**Patrik Johansson, Departement of Teaching and Learning, Stockholm university, Sweden

Schools in general, and social science education in particular, prepare youths for life in democracies. Teaching, especially in the social sciences, is expected to advance students' knowledge and to socialise them into becoming active and critical citizens with democratic behaviours and attitudes. However, there are challenges for teachers in realising these aims such as dealing with: tensions between thinking critically while being socialised, the trend of diminishing support for democracy among youths, and fading social and political trust in many countries. This paper reports from a research project that departed from the important role of social and political trust in democracies. The project was carried out as participatory action research with social science teachers. The paper addresses three areas with contributions to social science education. Firstly, we suggest educational gains from displacing democracy from traditional content areas, i.e., how students' reasoning about democracy benefit from engaging with democracy in other contexts than that of the structures of the political system. Secondly, we reflect on how teaching designs can provide new experiences and specific reasoning skills to students, particularly the significance of introducing social science theory in teaching. And thirdly, we address the value and potential gains of collaborations between teachers and researchers in performing educational design research, and how it can contribute with theoretical and practical knowledge that is relevant for academia, as well as for teachers' practice.

The relationship between students' reasoning about historical and social issues in inquiry tasks
Presenting Author: Fien Depaepe, KU Leuven, Belgium; **Presenting Author:**Karel Van Nieuwenhuyse, KU Leuven, Belgium; **Co-Author:**Marjolein Wilke, KU Leuven, Belgium

Several history education scholars argue that historical thinking not only increases students' familiarity with the practice of historians, but may also contribute to skills that are relevant for democratic citizenship. In particular, fostering students' historical inquiry skills is expected to improve their ability to critically evaluate contemporary sources, weigh evidence and substantiate a position towards social issues. These scholars assume that students will spontaneously transfer skills and procedural strategies acquired via historical inquiries to contemporary contexts. However, such a "far transfer" from one context to another is difficult to obtain, as educational research shows. There is currently little research examining whether such a spontaneous transfer is possible. This study builds on data stemming from an intervention study examining the effects of a lesson series specifically aimed at fostering students' historical inquiry competences on (a) students' historical inquiry skills and (b) democratic skills, using historical and topical essays based on multiple documents tasks. It explores in a qualitative way students' historical and topical essay tasks to explore differences between students' engagement with both tasks and to explore whether and on which particular aspects these tasks potentially showed signs of a transfer. To this end, a purposeful sample of students is selected who had progressed substantially on both tasks. The study reveals remarkable differences between students' historical and topical pretest essays and offers limited evidence for a spontaneous transfer from historical to democratic skills, among others in students' use of sources and attention for their reliability.

Session U 4

26 August 2023 16:30 - 18:00
UOM_A02
Symposium
Higher Education

Internal and External Influences that Promote Interest Development During Higher Education

Keywords: Achievement, Attitudes and Beliefs, Cultural Diversity in School, Curriculum Development, Higher Education, Interest, Mindsets, Motivation, Science and STEM, Self-regulated Learning and Behaviour
Interest group: SIG 08 - Motivation and Emotion, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Paul O'Keefe, Singapore
Chairperson: Kathleen M Quinlan, University of Kent, United Kingdom
Discussant: K. Ann Renninger, Swarthmore College, United States

Interest research emphasises the malleability of interest, with potential for it to develop from situational interest to well-developed interest through interactions with people, content, and activities (see O'Keefe & Harackiewicz, 2017; Renninger & Hidi, 2022). Higher education (HE) students rely on appraisals of their interests to make important educational and career decisions. Thus, the ways in which interest develops, particularly during HE, not only has instructional and curricular design implications, but could have far-reaching impact on workforce preparedness and productivity, and graduates' contributions to the wider world. Yet we still know little about how to best support students' interest development during HE. Practice-relevant research designed to support students' interest during HE needs to consider both the external influences educators create for students as well as the way students' beliefs and individual characteristics drive them to interact with those resources. Thus, this symposium investigates this balance between supporting structures, such as curricular design and educational interventions, and students' own beliefs and values. In doing so, this symposium considers a variety of contexts from different countries and different subject areas. Presenters draw on findings from longitudinal, intervention, and cross-sectional studies. They also consider how their findings advance our understanding of interest development in HE and its implications for theory, research, and practice.

Boosting STEM Interest Among Liberal Arts Undergraduates with a Brief Growth-Mindset Intervention
Presenting Author: Paul O'Keefe, Yale-NUS College, Singapore; **Co-Author:**E. J. Horberg, Yale-NUS College, Singapore; **Co-Author:**Carol Dweck, Stanford University, United States; **Co-Author:**Gregory Walton, Stanford University, United States

College presents unique opportunities for students to explore diverse disciplines and develop a breadth of interests—but if students view interests as relatively fixed, they may not explore new disciplines that can broaden and enrich their education. Could a brief intervention that portrays interests as developable boost interest, and even grades, in mandatory math and science coursework in an enduring way among students who begin college not identifying as a "math or science person"? In a randomized controlled field-experiment, first-year undergraduates (*N*=580) in the school of arts and social sciences of a large university completed a brief growth-theory-of-interest (vs. study-skills control) module before matriculating. Among those who entered college less identified with math and science, the intervention increased interest and final grades in two mandatory first-year math/science courses. Our results suggest that a growth theory promotes the development of new interests, which is crucial for successfully navigating a diverse college curriculum. By representing interests as having the potential to grow, colleges can encourage the development of interdisciplinary scholars. Such messages would be most usefully relayed to students at critical junctures in their educational trajectory, before they make important decisions about their future.

Interventions to Promote Interest in Introductory Chemistry and Longer-Term Persistence in STEM
Presenting Author:judith harackiewicz, University of Wisconsin-Madison, United States; **Co-Author:**Michael Asher, University of Wisconsin-Madison, United States; **Co-Author:**Cameron Hecht, The University of Texas at Austin, United States; **Co-Author:**Patrick Beymer, University of Wisconsin - Madison, United States

To increase diversity in STEM fields, we must address attrition in the STEM pipeline. We developed and tested a novel prosocial utility-value intervention (UVI) in an introductory college chemistry class, in a U.S. university, comparing it with a "standard" UVI and control condition, on interest, instructor perceptions and performance in the short term. We also followed students through graduation to examine persistence in STEM. We found that the prosocial UVI was particularly effective in promoting interest, deeper involvement in STEM courses, course performance, and perceptions that instructors valued prosocial applications of chemistry for first-generation students (students for whom neither parent has a college degree). Both the standard and prosocial UVI improved persistence, for all students.

Promoting Student Interest Via Culturally Sensitive Curricula in Higher and Professional Education
Presenting Author: Kathleen M Quinlan, University of Kent, United Kingdom; **Co-Author:**Dave Thomas, University of Kent, United Kingdom; **Co-Author:**Annette Hayton, University of Bath, United Kingdom; **Co-Author:**Jo Astley, University of Derby, United Kingdom; **Co-Author:**Leda Blackwood, University of Bath, United Kingdom; **Co-Author:**Fatmata Daramy, The University of Law, United Kingdom; **Co-Author:**Morag Duffin, The University of Law, United Kingdom; **Co-Author:**Muhammad Arslan Haider, University of Kent, United Kingdom; **Co-Author:**Deborah Husbands, University of Westminster, United Kingdom; **Co-Author:**Helen Kay, Sheffield Hallam University, United Kingdom; **Co-Author:**Mary Mosoeunyane, Buckinghamshire New University, United Kingdom; **Co-Author:**Ian Turner, University of Derby, United Kingdom; **Co-Author:**Clare Walsh, Sheffield Hallam University, United Kingdom; **Co-Author:**Dan West, University of Derby, United Kingdom

We examined whether English higher education (HE) students' perceptions of the cultural sensitivity of their curriculum supported their interest in their program of study. 286 (228 F) second-year undergraduates rated the cultural sensitivity of their curriculum on six scales and rated their interest and their relationships with teachers. Most students (69%) were enrolled in professional education programs, including nursing, law, and education. Racially minoritized students (*n*=99) perceived their curriculum as less culturally sensitive than White students (*n*=182). There were no significant differences between minoritized students and White students on interest or the perceived quality of relationships with teachers. Five dimensions of cultural sensitivity (Diversity Represented, Positive Depictions, Challenge Power, Inclusive Classroom Interactions, Culturally Sensitive Assessments) each predicted interest. Curricula and assessments that represent diversity positively, challenge unearned privilege, and promote inclusivity may support HE students' interest, particularly those studying professional education programs. Through its practical, situated description of curricular features, this study extends existing research on external (curricular/instructional)

factors that promote interest among HE students, with important implications for curricular design.

The Role of Implicit Theories about Interest when Regulating Motivation
Presenting Author: Carol Sansone, University of Utah, United States; **Co-Author:**Yun Tang, University of Utah, United States; **Co-Author:**Jasmine Norman, University of North Carolina, Wilmington, United States; **Co-Author:**Dustin Thoman, San Diego State University, United States

Maintaining motivation is often a challenge for college students. The Self-Regulation of Motivation (SRM) model embeds the interest experience within the self-regulation process (Sansone & Thoman, 2005), proposing that students may choose to engage in strategies that will help to create interest under certain circumstances. Thoman et al. (2020) further proposed that individuals might differ in beliefs that interest can be regulated, which may help to understand when interest regulation likely occurs. We used data collected as part of the Online Evaluation Project 2020 to examine whether students' implicit beliefs about interest regulation predicted use of interest development strategies when they found it difficult to sustain motivation, and the effects on motivation and performance outcomes. The more that students believed interest was malleable, the more likely they were to report using interest development strategies during the first third of the course when they found sustaining motivation to be difficult. Greater strategy use predicted greater interest at the end of the semester. Tests of moderated mediation showed that implicit beliefs indirectly affected final interest via strategy use especially when sustaining motivation was difficult. This process leading to greater final interest was associated with higher final grades. However, strategy use was also negatively associated with grades once the path through final interest was controlled, suggesting potential trade-offs. These results suggest that students can strategically work to develop interest as a response to motivational challenges, but this response depends on their beliefs about the nature of interest.

Session U 5

26 August 2023 16:30 - 18:00
UOM_R08
Single Paper
Assessment and Evaluation, Instructional Design, Teaching and Teacher Education

Peer Interaction and Feedback

Keywords: Assessment Methods, Cooperative/Collaborative Learning, Feedback, In-service Teachers, Instructional Design, Knowledge Construction, Learning Approaches, Peer Interaction, Teacher Professional Development, Writing/Literacy
Interest group: SIG 06 - Instructional Design, SIG 11 - Teaching and Teacher Education, SIG 12 - Writing, SIG 14 - Learning and Professional Development
Chairperson: Erdem Onan, Maastricht University, Netherlands

Effects of a comparative assessment method on how students use peer feedback for revision
Keywords: Assessment Methods, Feedback, Peer Interaction, Writing/Literacy
Presenting Author: Janneke stuulen, University Utrecht, Netherlands; **Co-Author:**Renske Bouwer, Utrecht University, Netherlands; **Co-Author:**Huub van den Bergh, Utrecht University, Netherlands

Peer feedback is often used in secondary education as an important learning tool. But implementing it effectively can be quite complicated. The aim of this study is to investigate if revising based on peer feedback is more effective than without peer feedback, and whether a comparative or a non-comparative assessment method affects how students provide and use peer feedback for revision. Participants were 65 high school students from three classes who each wrote and rewrote a persuasive text. The classes were randomly assigned to three different conditions: a comparative feedback condition, a non-comparative feedback condition and a control condition without peer feedback. Revision based on peer feedback resulted in higher text quality scores than revision without peer feedback. The feedback comments in the comparative condition directed students more towards revising higher order aspects in the text than in the non-comparative condition. However, a relation between text comments and revision quality could not be defined. It is remarkable that students in the comparative condition did receive relatively more feedback on higher order aspects, but didn't succeed to use this feedback effectively into a better second draft. Probably, they need more guidance or instruction on revision and peer feedback. Further research is needed to understand what additional support students need to effectively revise based on peer feedback.

Joint knowledge construction during feedback interaction in Reciprocal Peer Observation
Keywords: Feedback, In-service Teachers, Knowledge Construction, Teacher Professional Development
Presenting Author: Ester Miquel, Universitat Autonoma de Barcelona, Spain; **Co-Author:**Marta Flores, UAB Universitat Autònoma de Barcelona, Spain; **Co-Author:**Andy Morodo, Universitat Autònoma de Barcelona, Spain; **Co-Author:**David Duran Gisbert, Universitat Autònoma de Barcelona, Spain

Peer learning is a good mechanism for teachers' professional development, but there is little evidence of how it works. Reciprocal Peer Observation (RPO) involves a pair of teachers (both act as observer and observee) with similar degrees of experience and status who mutually agree to observe each other's practice. Using a category system based on Popp and Goldman (2016), this study analyses the discourse moves of 15 pairs of teachers during the interactive feedback session in RPO practice (30 recordings) to ascertain if, and how, the discourse between observer and observee plays a role in supporting the joint construction of knowledge. First, the interactive feedback sessions (80.4%) were separated from the monologic (19,6%), which indicates that most participants understood the feedback session as a space for dialogue. Considering 30 feedback sessions with interactive talk, nearly 66% of discourse moves are associated with joint knowledge construction. Explaining Thinking is the most frequent category, both for observers and observee. Self-reflecting on Practice is the most frequent for observer, especially in the subcode Acknowledging a good practice rather than recognizing an improvement in practice. Results show that feedback sessions are a good opportunity to joint knowledge construction between observer and observe, but providing supporting tools to the teachers who participate in RPO is necessary to improve the feedback interaction.

Providing Agency to Students in Peer Feedback Settings: The Free-Selection Approach
Keywords: Cooperative/Collaborative Learning, Instructional Design, Learning Approaches, Peer Interaction
Presenting Author: Pantelis Papadopoulos, University of Twente, Netherlands; **Co-Author:**Alieke van Dijk, University of Twente, Netherlands; **Co-Author:**Natasha Dmoshinskaia, University of Twente, Netherlands; **Co-Author:**Hannie Gijlers, University of Twente, Netherlands

This study explored the benefits of increasing students' agency in an online, double-blinded peer feedback process. A total of 63 Bachelor's students of Psychology volunteered to participate in the study. This included (a) a pre-test questionnaire on their experiences and preferences toward peer feedback, (b) a course activity in which they had to write a draft essay analyzing the potential of a learning tool, provide feedback to other students' drafts, and submitting the finished essay integrating peer feedback and own insights, and (c) a post-test questionnaire recording students' opinions on the process. In a free-selection setting, students are offered several peer works and they are free to apply their own criteria to read and review the one(s) they want. In the study, a hybrid approach was implemented by having the teacher assigning one reviewer to each draft and allowing the students to select and review *at least* one more draft from a random pool of four. The analysis showed that 16 out of the 63 students (25.39%) submitted more than the minimum two reviews (i.e., one assigned and one selected), while 20 out of the 30 students that answered a related question said that they read more than two peer drafts. Students acknowledged that providing feedback helped them identify their own strengths and weaknesses and reach own insights. Post-hoc analysis showed that students that reviewed more than the minimum number of draft essays were also significantly more appreciative towards the benefits of the peer feedback process.

Teachers' peer feedback in basic education
Keywords: Feedback, In-service Teachers, Peer Interaction, Teacher Professional Development
Presenting Author: Dolors Forteza Forteza, Universitat de les Illes Balears, Spain; **Co-Author:**Francisca Moreno Tallón, Universitat de les Illes Balears, Spain; **Co-Author:**Joana Llabrés Ferrer, Universitat de les Illes Balears, Spain; **Co-Author:**Begoña De la Iglesia Mayol, Universitat de les Illes Balears, Spain

In the framework of the research on Peer Observation and Feedback for Professional Development (PeerObserv), to analyse the effectiveness of peer observation practice for the improvement of teacher professional development, we present a systematic review on feedback that focuses on a dialogical model,

among primary and secondary school teachers. The main aim of this paper is to analyse previous research and report on the empirical evidence found, in order to specifically answer the following questions: a) What kind of research has been done on feedback among primary and secondary school teachers during the last decade, and which findings are reported., and b) What type of feedback is defined as effective in relation to improving teaching practice and teacher professional development? Following the PRISMA protocol, 30 peer-reviewed articles were selected based on inclusion criteria: peer-reviewed articles; focused on dialogic feedback; between teachers with the same rank and role in the school; not developed in higher education. The analysis evidences that the quality feedback is defined as a feedback that is not focused on the person but on the goal, is pro-active, cyclical, helps to improve classroom practices and enriches the school climate. It is relevant that the studies come to an agreement on the benefits of peer feedback, but find difficulties in ensuring that it takes place between equal partners and that the conversation follows the characteristics that define quality dialogic feedback. Based on the findings, numerous recommendations for developing research and practice of teacher feedback in schools are suggested.

Session U 6

26 August 2023 16:30 - 18:00
UOM_A08
Single Paper
Cognitive Science, Higher Education, Motivational, Social and Affective Processes

Interest and Boredom in University Students

Keywords: Achievement, Cognitive Skills and Processes, Emotion and Affect, Higher Education, Instructional Design, Interest, Meta-analysis, Motivation, Multimedia Learning, Personality, Quantitative Methods, Well-being
Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion
Chairperson: Alberto Nagle Cajes, Uruguay

Effect of Interest Fit on Academic Success in Higher Education: Meta-Analysis and Systematic Review
Keywords: Achievement, Higher Education, Interest, Meta-analysis
Presenting Author: Nicky de Vries, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Martijn Meeter, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Mariette Huizinga, Vrije Universiteit Amsterdam, Netherlands

A satisfying fit between student and study program is critical to academic success (i.e., academic achievement, satisfaction with their program, and retention). Previous studies examining the effect of interest fit in higher education on academic success reported mixed results. This might be attributed to (1) different operationalizations of interest fit, (2) the type of interest measure used, (3) the outcome under examination, or (4) the educational system that is the context of the study. In order to evaluate the effect of interest fit on academic success, a meta-analysis is needed. We performed a systematic review and meta-analysis. We included empirical, peer-reviewed articles published between 2000 and 2021, involving a measure of fit between student and study-program (i.e., interest congruence) as predictor and used a measure of academic success as outcome variable. Preliminary meta-analytic results showed that interest congruence was positively related to measures of academic success. The operationalization of fit was a significant moderator of the relation between fit and satisfaction. The majority of the studies included in the systematic review was carried out in the United States, which has a different educational system than most European countries with regard to choosing a study program in higher education. Thus, the interpretation of the results warrants firm conclusions on the European educational system. Further research should confirm the positive effect of interest fit between a student and study program on academic success in European countries.

Does the situation matter for learning? Effect of mind wandering and interest in multimedia learning
Keywords: Cognitive Skills and Processes, Interest, Motivation, Multimedia Learning
Presenting Author: Perche Louise, Paris Nanterre University, France; **Co-Author:**Yennek Nora, Paris Nanterre University, France; **Co-Author:**Leger Laure, Paris Nanterre University, France

Abstract
In this research, we explored the interaction between the individual and situational dimensions of interest and mind wandering and their impact on learning. Mind wandering is deleterious to performance, particularly during a sustained attention task (Cheyne et al., 2009), during reading tasks for text comprehension (Mooneyham & Schooler, 2013), or in a learning context (Szpunar et al., 2013). 165 undergraduate students filled up questionnaires about their topic interest, prior knowledge, and tendency to mind wander. They then viewed a 16.5-minutes sound PowerPoint on introductory statistics during which there were 4 probes caught measures. After the viewing, they completed questionnaires about their situational interest, their mind wandering during the task, and a learning questionnaire. Our results showed that mind wandering appeared to be a central variable explaining learning scores, which replicates the results found by Kane et al. (2017). Mind wandering mediated the impact of situational interest on learning. These results have important relevance to the educational field, as they highlight the importance of situational characteristics in learning.

Watching the paint dry in the classroom. Evolution and predictors of boredom in bachelor students
Keywords: Emotion and Affect, Higher Education, Personality, Well-being
Presenting Author: Velibor Mladenovici, West University of Timisoara, Romania; **Co-Author:**Laurentiu P. Maricutoiu, West University of Timisoara, Romania; **Co-Author:**Daniela - Georgiana Valache (Voinescu), West University of Timisoara, Romania; **Co-Author:**Zselyke Pap, West University of Timisoara, Romania; **Co-Author:**Eusebiu Stefancu, West University of Timisoara, Romania; **Co-Author:**Bianca Popescu, West University of Timisoara, Romania; **Co-Author:**Marian Ilie, West University of Timisoara, Romania; **Co-Author:**Delia Virga, West University of Timisoara, Romania

In higher education, boredom is one of students' most frequent emotions, but the empirical evidence regarding its evolution is scarce. In the current study, we investigated the evolution of student boredom during a semester. We also considered the role of self-esteem and personality traits in this process. We utilized a longitudinal approach to analyze 605 answers from 135 undergraduate psychology students (mean age = 22.27, 84.45% female) from a Romanian university. In the beginning of the semester, students completed the IPIP-50 personality questionnaire. During the semester, every 3 weeks, students completed self-reported inventories that assessed student boredom and self-esteem. We analyzed our data using a multilevel structural equation modeling approach. Results suggested that students declared themselves more bored as the semester progresses. Also, we found that students' self-esteem plays a significant role in decreasing boredom (i.e., as student self-esteem increased during the semester, their boredom decreased). The relationship between measurement moments and student boredom was moderated by extraversion (i.e., extraverted students had a larger increase in boredom as the semester unfolded, as compared with introverted students) and by emotional stability (i.e., emotionally stable students had smaller increases in boredom). Even more, as students advanced in the semester, their self-esteem increased. This relationship was moderated by the students' emotional stability and openness. Finally, inter-personal levels of boredom were negatively associated with students' conscientiousness. The current investigation results bring valuable input for academic instructional developers and student counselors, bringing insight for better managing student boredom throughout academic semesters.

Students' situational boredom: Typology and relations to the requirement-skill fit
Keywords: Emotion and Affect, Higher Education, Instructional Design, Quantitative Methods
Presenting Author: Lina Wirth, Leuphana University Lueneburg, Germany; **Co-Author:**Poldi Kuhl, Leuphana Universität Lüneburg, Germany; **Co-Author:**Timo Ehmke, Leuphana Universität Lüneburg, Germany; **Co-Author:**Jan Retelsdorf, University of Hamburg, Germany; **Co-Author:**Burak Aydin, Leuphana University Lueneburg, Germany

Boredom is a commonly experienced emotion of students in learning and achievement contexts. It can be assumed to be essentially determined by the task-related requirements, such as language requirements, of a learning situation and to result from a mismatch between learners' skills and those requirements. To analyze boredom as a function of the mismatch between task requirements and students' skills, in this study we first examined the development of boredom over the course of a learning situation and second, whether groups with different developmental trajectories of boredom could be identified. Third, we

investigated whether boredom develops differently as a function of language requirements. To do this, we varied the language features of an instructional video on a statistical topic linguistically (easy vs. moderate vs. difficult). *N*=123 students were randomly assigned to one of these three language conditions and rated their boredom before, during and after viewing the video. Finally, we exmined whether the fit between language requirements and language skills is related to the development of boredom. While we did not find any significant changes in boredom over the course of the learning situation across all students, two groups of students could be identified that showed significantly different trajectories of boredom (decreasing vs. increasing). The trajectories did not differ as a function of the language requirements. However, students assigned to the linguistically difficult instructional video showed different trajectories of boredom depending on their language skills; hinting at the importance of a requirement-skill fit for emotional well-being in learning contexts.

Session U 7

26 August 2023 16:30 - 18:00
AUTH_TE2
Single Paper
Instructional Design, Learning and Instructional Technology

Game-based Learning in Maths and Economics

Keywords: Achievement, Educational Technologies, Game-based Learning, Instructional Design, Interest, Mathematics/Numeracy, Motivation, Secondary Education
Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction
Chairperson: Panayiota Metallidou, Aristotle University of Thessaloniki, Greece

Effects of an Adaptive Math Learning Program on Students' Performance, Self-Concept and Anxiety
Keywords: Achievement, Game-based Learning, Mathematics/Numeracy, Motivation
Presenting Author: Anna Hilz, IPN - Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Karen Aldrup, IPN - Leibniz Institute for Science and Mathematics Education, Germany

Using digital math learning programs in schools was expected to have a revolutionary impact on students' learning. However, effects regarding such programs are mostly small and heterogeneous, and hence disappointing. Following the ongoing debate in the literature about *why* to continue research on math learning programs, we aim to reframe this question into *how* to continue research on math learning programs. Studies on such programs are lacking that consider a wide set of outcome variables, such as differentiating performance measures+ and affective-motivational variables. Moreover, as students can only benefit from a program if they indeed use it, researchers need to take practice behavior into account. Therefore, we investigated whether the adaptive arithmetic learning program Math Garden fosters students' math performance (addition and subtraction), math self-concept, and a reduction of math anxiety, and how practice behavior (practiced tasks and practiced weeks) affect the investigated variables. We used a pre-post control group design with a total of 357 German fifth-grade students. Randomization took place on the class level. Students in the experimental condition practiced with the program for 22 weeks. Math self-concept only improved in the experimental condition. Students' subtraction performance improved as a function of practiced tasks, and addition performance improved as a function of practiced weeks. We found no effects on math anxiety.

The Strength and Direction of the Adaptation Affect Situational Interest in Game-Based Math Learning
Keywords: Educational Technologies, Game-based Learning, Interest, Mathematics/Numeracy
Presenting Author: Antti Koskinen, University of Tampere, Finland, Finland; **Co-Author:**Jake McMullen, University of Turku, Finland; **Co-Author:**Minna Hannula-Sormunen, University of Turku, Finland; **Co-Author:**Manuel Ninaus, University of Graz, Austria; **Co-Author:**Kristian Kiili, Tampere University, Finland

Research has shown that difficulty adaptation is a promising instructional technique in digital game-based learning. Nevertheless, although the strength and direction of difficulty adaptation can affect motivational outcomes, these effects remain insufficiently examined in game-based learning. This within-subject study examined how the strength and direction of difficulty adaptation affected motivational outcomes in digital game-based math learning. The participants were 167 Finnish fifth-graders who studied fractions with the Number Trace game. The game included 144 number line estimation tasks, half were adapted according to participants' playing performance. Situational interest and perceived difficulty were measured several times with in-game self-report items during the intervention. The manipulation check confirmed that difficulty adaptation was implemented successfully as task correctness and perceived difficulty changed according to the strength and direction of adaptation. Regarding motivational outcomes, two-way repeated-measures ANOVAs showed that the difficulty adaptation increased situational interest, but only when the task difficulty was substantially adapted downwards. Contrary to our expectations, a substantial upwards adaptation of the task difficulty significantly decreased situational interest. Minor adaptation of difficulty did not affect situational interest. The current study contributes to the field of adaptive digital learning environments by highlighting the effects of the strength and direction of difficulty adaptation on motivational outcomes.

The Effectiveness of an Adaptive Digital Educational Game to Enhance Fraction Understanding
Keywords: Educational Technologies, Game-based Learning, Instructional Design, Mathematics/Numeracy
Presenting Author: Febe Demedts, University of Leuven - Campus KULAK, Belgium; **Co-Author:**Bert Reynvoet, KU LEUVEN, Belgium; **Co-Author:**Delphine Sasanguie, Hogeschool Gent, Belgium; **Co-Author:**Manuel Ninaus, University of Graz, Austria; **Co-Author:**Kristian Kiili, Tampere University, Finland; **Co-Author:**Fien Depaepe, KU Leuven, Belgium

It is of major concern that cognitive and noncognitive difficulties interfere with developing a thorough fraction understanding. Regarding cognitive difficulties, learners possess several misconceptions that underlie the difficulties of mastering the complex domain of fractions. Regarding noncognitive difficulties, feelings of math anxiety also play a role in the learning of fractions. Given these cognitive and noncognitive difficulties, it is critical to provide adequate instruction on fractions. A promising method is the use of adaptive educational games to foster students' learning. However, evidence on the effectiveness of adaptive educational games is rather mixed because previous research has not yet rigorously examined the benefits of different game features. This study aims to (1) unravel the difficulties learners encounter when performing a number line estimation (NLE) task and (2) examine the effectiveness of an adaptive digital educational game. Regarding the first research aim, we observed moderate proficiency in NLE-tasks and identified two misconceptions (i.e., natural number bias and unit of reference bias). For the second aim of this study, we investigate the effectiveness of an adaptive educational game to tackle these difficulties by comparing a condition based on corrective feedback with a condition based on adaptive, exploratory feedback tackling students' misconceptions. Participants are randomly assigned to one of the two experimental conditions of the Number Trace Fraction Game (with or without adaptive feedback) or the control condition (playing a non-fraction game).

Serious Games in Economics Education: The influence of game mechanics and reflection prompts
Keywords: Game-based Learning, Instructional Design, Interest, Secondary Education
Presenting Author: Liane Platz, University of Konstanz, Germany; **Co-Author:**Michael Jüttler, University of Konstanz, Germany

The implementation of serious games in economics education offers advantages over more traditional learning approaches when it comes to fostering subject-specific competencies, especially regarding knowledge development. However, it is still unclear how such game-based learning environments have to be designed in order to result in positive learning outcomes when it comes to promoting other sub-facets, such as motivation and interest. In a design comparison (n = 292), a quasi-experimental approach based on a 2x2 control group design with four points of measurement is applied to study different game mechanics and reflection prompts in order to observe effects on the development of financial interest of upper secondary school students in economics. In this regard, structural equation models are used to a) observe the effect of the level of game complexity and the mediating role of basic needs experience and b) the effect of direct and generic reflection prompts on the development of domain-specific interest in financial topics. First results show, that games which offer a higher degree of strategic decision options and direct reflection prompts positively influence students' situational interest with moderate effect size. Long-term effects on students' domain-specific competency are part of current data curation and analyses. Thus, we expect that serious games can promote subject-specific

interest if they are challenging for the game players and at the same time accompanied by direct reflection prompts.

Session U 8

26 August 2023 16:30 - 18:00
UOM_A13
Single Paper
Motivational, Social and Affective Processes

Motivational Beliefs and Attainment

Keywords: Achievement, Educational Attainment, Interest, Motivation, Primary Education, School Effectiveness, Science Education, Secondary Education, Self-determination, Teaching/Instructional Strategies
Interest group: SIG 08 - Motivation and Emotion, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Charlotte Arnou, KU Leuven (BE), Belgium

Motivation and attainment: a systematic review of recent studies
Keywords: Achievement, Educational Attainment, Motivation, School Effectiveness
Presenting Author: Daniel Muijs, Queen's University Belfast, United Kingdom

The importance of motivation has long been a contentious topic in education. While the existence of a correlation between the two is established, there is discussion, not least among practitioners, of the causal direction of the relationship and therefore whether schools need to focus primarily on approaches to improve motivation or on approaches to improve attainment. In this study we used a systematic literature review approach to look at recent evidence on this relationship. Findings suggest that the relationship is clearly reciprocal, and while in primary the impact of attainment on motivation tends to be stronger than vice versa, this is no longer true in secondary. This suggests that schools need to take a dual-track approach, focusing on both attainment and motivation, in order to develop a positive cyclical effect.

Adolescents' expectancies and values in phenomenon-based learning and various school subjects
Keywords: Achievement, Interest, Motivation, Primary Education
Presenting Author: Inka Ronkainen, University of Helsinki, Finland; **Co-Author:**Janica Vinni-Laakso, University of Helsinki, Finland; **Co-Author:**Katariina Salmela-Aro, Helsinki University, Finland; **Co-Author:**Veli-Matti Vesterinen, The University of Helsinki, Finland

According to the expectancy-value theory, student motivation consists of gender roles, the self-concept of ability, success expectations and subjective values. Phenomenon-based learning was elevated in the newest Finnish national core curriculum since teachers are obligated to teach multidisciplinary modules. The aim of the study was to examine Finnish middle school students' motivation towards different subjects and phenomenon-based learning. 1013 Finnish 7^{th} grade students (mean age 13.8, 54 % girls) answered an electronic questionnaire in 2019, which had questions related to school motivation and well-being. With a person-oriented approach, five different motivation profile groups were identified among 7^{th} graders' success expectations and subjective values towards phenomenon-based learning, Finnish language, mathematics and physics. Identified groups were named as follows*: phenomenon-oriented* (23%), *motivated and well-being* (24%), *weakly motivated* (15%), *motivated but loaded* (16%) and *science-oriented* (26%). Phenomenon-oriented students were more interested in phenomenon-based learning and science-oriented students hold higher interest value in mathematics and physics compared with other subjects. Motivated and well-being were interested in all subjects and were not burdened by studies, whereas motivated but loaded students hold high attainment value across subject domains, but they also showed high cost value. Weakly motivated did not value any of the subjects and the study was perceived as burdensome and challenging. According to the cross-tabulation, girls were more evenly distributed in all profile groups, while the percentage of boys was lower in phenomenon-oriented group compared with girls. School performance was lower in weakly motivated and higher in motivated and well-being compared with other groups.

Changes in students' interest, competence and choice towards science learning on a long-term setting
Keywords: Interest, Motivation, Science Education, Self-determination
Presenting Author: Moonika Teppo, University of Tartu, Estonia; **Co-Author:**Miia Rannikmäe, University of Tartu, Estonia; **Co-Author:**Regina Soobard, University of Tartu, Estonia

The purpose of the current study was to examine on a long term-setting the change in and associations between students' interest, competence and choice towards science learning being components of intrinsic motivation based on self-determination theory. Data were collected twice – at first when students were in grade 6 and secondly after three years when the same students were in grade 9. A sample of 171 lower secondary school students completed the self-reported questionnaire. Descriptive statistics and correlation analysis was used identify the possible changes and relationships between interest, competence and choice. The results indicated a significant decrease in students' competence, although not in interest, nor perceived choice change towards science learning on comparing outcomes from grades 6 and 9. Correlation analysis showed strong positive relationship between competence and interest among students answers in both grades. Results and implications for science learning at lower secondary level will be discussed during the presentation.

Teaching to the test - killing students' motivation for the sake of good grades?
Keywords: Achievement, Motivation, Secondary Education, Teaching/Instructional Strategies
Presenting Author: Joy Muth, University of Vienna, Austria; **Co-Author:**Marko Lüftenegger, University of Vienna, Austria

Standardized tests have become a gold standard for assessing students' competencies, but also the quality of teachers and schools. To help their students score high, many teachers apply a test-centered instruction style, also known as "teaching to the test" (TTT). Although TTT is claimed to help raise test scores, no knowledge exists about how this teaching style affects students' daily academic lives and experiences. This study investigated whether TTT is associated with secondary students' intrinsic motivation, perceived importance, utility, and cost of engaging with the subject, their subject-specific self-efficacy, and test performance. The sample consisted of 1625 11^{th}-grade students, from 30 Austrian high schools, who were surveyed about their experiences in English class. Perceived teaching to the test practices were measured with 4 scales from a newly developed measurement instrument. Four multiple regression models with gender as a covariate were conducted. Results showed statistically significant positive associations between the TTT scales repetitive exercising, test-taking strategies, and reference to the test with intrinsic motivation, importance, and utility, but not with cost. Repetitive exercising further showed significant positive associations with self-efficacy and a small positive effect on test-performance. An authoritarian teaching style showed statistically significant negative associations with intrinsic motivation, importance, utility, self-efficacy and test performance while having significant positive associations with cost. Our results suggest that, contrary to current beliefs, TTT, except for authoritarian teaching, might rather enhance than reduce students' motivation, while not impacting test performance to a significant degree.

Session U 9

26 August 2023 16:30 - 18:00
AUTH_DC2
Single Paper
Culture, Morality, Religion and Education, Higher Education, Teaching and Teacher Education

Participatory Research, Science Communication and Dialogic Pedagogy

Keywords: Communities of Learners and/or Practice, Cultural Diversity in School, Dialogic Pedagogy, Educational Attainment, Engagement, In-service Teachers, Inclusive Education, Morality and Moral Development, Pre-service Teachers, Primary Education, Qualitative Methods, Synergies between Learning / Teaching and Research, Teacher Effectiveness, Teacher Professional Development

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education, SIG 13 - Moral and Democratic Education, SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Gabriel Fortes, Universidad Alberto Hurtado, Chile

Participatory Research with youth as a Panacea for Educational Inequalities? A Meta-ethnography
Keywords: Communities of Learners and/or Practice, Inclusive Education, Qualitative Methods, Synergies between Learning / Teaching and Research
Presenting Author: Aline Muff, The Hebrew University of Jerusalem, Israel; **Co-Author:**Aviv Cohen, The Hebrew University of Jerusalem, Israel

A growing amount of research employs participatory methods in which the participants take an active role in gathering and analyzing empirical data in collaboration with the investigators. Such approaches have the potential to make education and educational research more meaningful for both participants and researchers – especially in times of global uncertainty and increased complexity. Considering the diverse use of the label “participatory,” we saw a need to examine participatory action research (PAR) studies to understand better how researchers justify its use and conceptualize its purposes and goals. Focusing on PAR research with young people, we conducted an interpretive meta-ethnography of 122 studies. Our review identified four distinct types of PAR studies, reflecting different ontological and epistemological approaches: technical, capacity building, justice oriented, and transformative. We conclude that while the use of PAR is not necessarily a panacea to address educational inequalities, academic studies should better align with the transformative approach that has the potential to support participants in becoming agents of change by engaging them in self-directed civic learning and activism.

Social disadvantage, classroom talk and educational attainment: RCT of a dialogic teaching programme
Keywords: Dialogic Pedagogy, Educational Attainment, Primary Education, Teacher Professional Development
Presenting Author: Jan Hardman, University of York, United Kingdom

Research shows that socio-economically disadvantaged students underperform in UK primary schools; therefore, there is a need to close the attainment gap between these students and their peers. Informed by social-cultural learning theories and Alexander’s dialogic teaching framework, a dialogic teaching programme was developed to close the gap. This paper reports on findings of the randomised controlled trial of the programme addressing two questions: 1) Does dialogic teaching improve the quality of classroom talk in primary English, mathematics and science? and 2) Does dialogic teaching improve students’ attainment? The study involved 76 schools in disadvantaged areas of England (randomly assigned to the intervention and control groups), 152 teachers and 5,000 aged 9-10 students. The intervention teachers received the dialogic teaching training lasting 20 weeks, and the control teachers did business as usual. 156 lessons were video-recorded and analysed quantitatively using a coding scheme for classroom talk alongside the discourse analysis of lesson transcripts. In addition, student test scores in English, mathematics and science were collected. The analysis of lesson recordings and transcripts showed that the quality of classroom talk improved significantly in the intervention schools. The test scores showed that students in the intervention schools made two additional months’ progress in English, mathematics and science compared to students in control schools, on average. The study empirically verifies the positive impact of dialogic teaching on classroom processes and students’ learning outcomes. Further research is needed to determine the sustainability of the effects of the intervention over time.

Visualizing Effect Sizes for SciComm: Which Plot Types and Enrichment Options Support Sense-Making?
Keywords: In-service Teachers, Pre-service Teachers, Teacher Effectiveness, Teacher Professional Development
Presenting Author:Jürgen Schneider, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Kirstin Schmidt, University of Education Karlsruhe, Germany; **Co-Author:**Kristina Bohrer, University of Education Karlsruhe, Germany; **Co-Author:**Andreas Lachner, University of Tübingen, Germany; **Co-Author:**Samuel Merk, PH Karlsruhe, Germany

Effect sizes are a key piece of information in scientific evidence. Science communication aims to provide this information in a way that is easy to understand. In three studies, we are exploring ways to visualize effect sizes to support teachers' sense-making from effect sizes. In a Delphi study, four data visualization experts collected and ranked 44 visualization types suitable for the target audience of teachers. The four most promising visualization types are examined in Study 1 for their ability to promote understanding (sensitivity, accuracy), information processing (cognitive load) in a resource-sensitive way (efficieny), as well as assessing practical implications (value for practice, informativity) in teachers. In a 4x6 within-design, N = 40 teachers evaluated all four visualization types displaying six different effect sizes. Results indicate half-eye plots to be most efficient and most helpful for promoting information processing and deriving practical implications, whereby gardner-altman plots and raincloud plots are comparably sensitive and accurately perceived. Study 2 will explore the additional enrichment options of 'benchmarking' and 'cues' for visualization and their effect on understanding, information processing, resource-sensitivity and derivation of practical implications. The findings have direct implications for science communication for evidence-informed instruction, such as information representation in clearinghouses.

Dialogic Problematization of Academic Integrity Education
Keywords: Cultural Diversity in School, Dialogic Pedagogy, Engagement, Morality and Moral Development
Presenting Author: Mark Smith, Kean University, United States

Many university educators have argued for a need for academic integrity education as an alternative to a focus on students’ and scholars’ compliance with academic rules and conventions (Brimble, 2016; Christensen Hughes & Bertram-Gallant, 2016; Hutton, 2006). I argue that the universal ethical-moral discourse of academic integrity disciplines subjects to comply with frequently alienating academic practices. This ethical discourse focuses on individual responsibility, in turn rendering invisible the authority of sometimes dysfunctional and oppressive instructional and summative assessment practices. Taking a Bakhtinian dialogic authorial perspective, the paper calls on students, scholars, instructors, and academic advisors to engage in critical ontological dialogue on diverse responses and motivations in regard to academic demands and deeds. Dialogue on situated instead of universal ethics in academic settings contextualizes and problematizes not just individual actions but also the ethics of the summative assessment regime, the instruction, the curriculum, authority dynamics, and the educational system as a whole. This discussion on academic integrity violations calls on educators to consider the ethical value of separating summative assessment from instruction.

Session U 10

26 August 2023 16:30 - 18:00
UOM_A04
Single Paper
Assessment and Evaluation, Learning and Social Interaction, Motivational, Social and Affective Processes

Social Processes in Computer-supported Collaborative Learning

Keywords: Assessment Methods, Computer-supported Collaborative Learning, Cooperative/Collaborative Learning, Eye Tracking, Large-scale Assessment, Mixed-method Research, Peer Interaction, Problem Solving, Self-regulated Learning and Behaviour, Social Aspects of Learning and Teaching, Social Interaction
Interest group: SIG 01 - Assessment and Evaluation, SIG 10 - Social Interaction in Learning and Instruction, SIG 16 - Metacognition and Self-Regulated Learning, SIG 27 - Online Measures of Learning Processes
Chairperson: Julie Vaiopoulou, Aristotle University of Thessaloniki, Greece

Investigating productive social interaction and the development of a group atmosphere in CSCL
Keywords: Computer-supported Collaborative Learning, Peer Interaction, Self-regulated Learning and Behaviour, Social Aspects of Learning and Teaching
Presenting Author: Azusa Nakata, University of Oulu, Finland; **Co-Author:**Karel Kreijns, Open University of the Netherlands, Netherlands; **Co-Author:**Armin Weinberger, Saarland University, Germany; **Co-Author:**Marija Milosevic, Saarland University, Germany; **Co-Author:**Hanna Jarvenoja, University of Oulu, Finland

Productive social interactions are keys to successful collaborative learning, but cannot be taken for granted. Interacting in an online space is especially challenging with limited social affordance and context cues. In this study, we investigated students' social interactions and the development of their group atmosphere through an online Computer Supported Collaborative Learning (CSCL) course. Participants were higher education students (n=38) from four European universities. They worked on a collaborative task in an online CSCL environment within a small group for six weeks. The data scope includes questionnaires on their perceptions towards the collaboration process and environmental support, self- and group evaluation in a Group Awareness Tool, and video recordings of their meetings. Two groups, namely a high- and a low-performing group were determined by the questionnaire results and final grades of the course and moved onto a qualitative content analysis. The results show that the high-performing group developed their group atmosphere as the course progressed and trust among the members was particularly high (=92.4). Conversely, the low-performing group's indicators of group atmosphere dropped in the middle of the course, especially in the trust category. In both groups, higher levels of argumentative knowledge construction, such as integrating and modifying peers' opinions, rarely occurred. However, there were some notable differences in group-level regulation and emotional valence in the two groups, which influenced their group atmosphere development.

Making invisible visible– Exploring social processes of remote collaborative problem solving
Keywords: Computer-supported Collaborative Learning, Eye Tracking, Mixed-method Research, Social Interaction
Presenting Author: Johanna Pöysä-Tarhonen, University of Jyväskylä, Finland; **Co-Author:**Shupin Li, University of Jyväskylä, Finland; **Co-Author:**Jarkko Hautala, Niilo Mäki Institute, Finland; **Co-Author:**Nafisa Awwal, University of Melbourne, Australia; **Co-Author:**Päivi Häkkinen, University of Jyväskylä, Finland

To better understand remote CPS and the related social processes, the current study relies on the concept of joint attention (JA) behaviour and applies eye-tracking data and methods for time series analysis to search for quantitative indicators of JA to be further verified by theory-driven, qualitative examinations. The study involved the following: (1) dual eye-tracking data of 12 dyads was analysed for the strength of the coupling of their eye gazing during CPS (as cross-recurrence quantification analysis, CRQA). The measures of CRQA served as a proxy of joint visual attention (JVA) and a possible indicator of higher attentional levels of JA (mutual and shared attention) in dyadic interaction during CPS. The results of CRQA were able to identify prominent values of coupling between individuals regarding JA. The qualitative interaction analysis on multimodal observational data (logfiles, scan path videos) of the dyads, selected on the basis of the highest recurrence rates, made visible behaviour related to the higher attentional levels of JA, indicating mutual attention level between the partners.

Group Learning or Learning Group? A Social Network Analysis on Group Regulated Learning
Keywords: Cooperative/Collaborative Learning, Self-regulated Learning and Behaviour, Social Aspects of Learning and Teaching, Social Interaction
Presenting Author: Mathias Mejeh, University of Bern, Switzerland

After four decades of research and theory development, it can be stated that Self-Regulated Learning (SRL) and Socially-Shared Regulated Learning (SSRL) are central educational principles for the successful learning of students. This is especially the case in higher education as learners are expected to be more autonomous in their learning and increasingly required to collaborate in small groups over a longer period. In this study, longitudinal questionnaire data from 80 university students over a course of 6 weeks were analyzed by stochastic-actor-oriented-models (SAOM). The question of how metacognitive regulation develops over time and which social factors are responsible for this change was investigated. Findings suggest that both individual and group structural factors are relevant for successful metacognitive regulation.

Measuring collaborative problem-solving skills in primary and secondary school students
Keywords: Assessment Methods, Computer-supported Collaborative Learning, Large-scale Assessment, Problem Solving
Presenting Author:matias rojas, Universidad Diego Portales, Chile; **Co-Author:**Miguel Nussbaum, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**César Moreno, Red Educacional los Conquistadores, Chile; **Co-Author:**Camila Rojas, Red Educacional los Conquistadores, Chile

In recent years, Collaborative Problem Solving (CPS) has become essential in almost all areas of life. Consequently, different theoretical frameworks and assessment instruments have emerged for measuring this skill. However, a frequent limitation among CPS studies is that they have only been validated for use at specific ages. Therefore, this research aims to validate a CPS assessment instrument that can be used for primary and secondary school students. A sample of 1024 students was analysed to validate the instrument among different ages. This sample comprised 476 boys and 548 girls aged between 10 and 18 assessed during the period of mandatory quarantine due to the COVID-19 pandemic. The results showed good validity and reliability of the instrument for assessing CPS between the fifth and twelfth grades of k12. Furthermore, it can be seen from the results that there is an association between the grade to which the student belongs and the level of achievement obtained in the assessment.

Session U 11

26 August 2023 16:30 - 18:00
UOM_R09
Single Paper
Assessment and Evaluation, Cognitive Science, Higher Education

Thinking and Reasoning in Science Education

Keywords: Assessment Methods, Cognitive Skills and Processes, Engineering Education, Higher Education, Metacognition, Qualitative Methods, Quantitative Methods, Reasoning, Science and STEM, Science Education
Interest group: SIG 04 - Higher Education, SIG 16 - Metacognition and Self-Regulated Learning, SIG 26 - Argumentation, Dialogue and Reasoning
Chairperson: Monika Waldis, University of Applied Sciences Northwestern Switzerland, Switzerland

The context matters: Exploring students' use of the resonance concept in organic chemistry tasks
Keywords: Higher Education, Qualitative Methods, Reasoning, Science and STEM
Presenting Author: Irina Braun, Justus-Liebig-University Giessen, Germany; **Co-Author:**Nicole Graulich, Justus-Liebig-University Giessen, Germany

Resonance is a crucial concept in organic chemistry that enables deriving chemical properties, molecular structures, and predicting reactions. Despite its importance for problem-solving and learning success in organic chemistry, research in chemistry education has shown that learners encounter various difficulties regarding the resonance concept, foremost a fragmented conceptual understanding of the concept, which leads to misconceptions. Although prior research also indicates that students apply this concept inadequately in problem-solving tasks, these studies are often limited to singular contexts. Given that task approaches and reasoning are context-dependent, it remains unclear how students use the resonance concept across different task contexts. However, such insights are essential to identify possible conceptual gaps and, subsequently, to support students adequately regarding the acquisition and application of this concept.
To this end, a qualitative study was conducted with 21 undergraduate chemistry students, all beginners in organic chemistry. The participants solved three organic case comparison tasks in (un-)familiar contexts requiring the application of the resonance concept, followed by a retrospective semi-structured interview focusing on their reasoning and problem-solving process. Through the analytical lens of the Coordination Class Theory, the extent to which students used their representations of resonance structures, and the variety of resource activation and connection in problem-solving across different tasks were examined. Although all students referred to similar structural features, the individual associations differed. As resources concerning the electronic level proved productive across different contexts, these ideas should be strengthened in future instructional interventions.

Disclosing own reasoning while appraising others'. Implications for formative assessment development
Keywords: Assessment Methods, Engineering Education, Reasoning, Science Education
Presenting Author: Mariana Orozco, University of Twente, Netherlands

When tutors assess students' reports to appraise these students' scientific reasoning, they disclose their own concerns, epistemological assumptions, and beliefs about science. The analysis of such assessments (i.e., rubric-centred scores and the corresponding justificatory comments), offer a wealth of insights that

can be re-engaged in the improvement of the assessment tool and procedure, and used for further developments in formative assessment more generally. Such insights include: concerns exceeding the rubrics descriptions (about meaningfulness, exhaustiveness, implicitness, connectivity, vagueness, true inquiry, relevance); and differences among assessors (regarding epistemic values, approaches to scoring, positionings, and sensitivity). This contribution is part of a broader research effort to promote students' conducive ways of scientific thinking and deep-learning, and is embedded in engineering-science education, in the field of Chemical Science Engineering. This study was guided by the question: What does the assessors' reasoning tell about the ways in which formative assessment is conducted, and could ideally be (in consideration of the course intended learning outcomes)? The main implication for developments in formative assessment resides in a call for reconceptualisation of assessment criteria, as the result of a co-design activity where it appears crucial to consider the assessors' reasoning. Our investigation connects to existing knowledge and discussions on formative assessment, focussing on issues of representativeness and granularity. The full paper elaborates on our process of co-design of the assessment tool, the proper assessment procedure, and the analytical steps and pieces of evidence to support our claims. Further implications for educational research and for educational practice are discussed.

Examining all the evidence: Do undergraduates prioritize a review of studies over a single study?
Keywords: Higher Education, Quantitative Methods, Reasoning, Science Education
Presenting Author: Etsuji Yamaguchi, Kobe University, Japan; **Co-Author:**Clark Chinn, Rutgers University, United States; **Co-Author:**Hiroki Oura, Tokyo University of Science, Japan; **Co-Author:**Toshio Mochizuki, Senshu University, Japan

Today's digital world is rampant with information in which different experts make diverse claims which contradict each other. To resolve such contradictions, one strategy is to consider the full body of evidence relevant to the issue. Instead of examining only one or two pieces of evidence, science experts synthesize large bodies of evidence in meta-analyses and other kinds of reviews. However, there is a lack of research on whether non-experts give greater weight to reviews of studies over single studies. Therefore, we conducted an experiment to investigate whether undergraduates prioritize evidence from reviews of studies over evidence from a single study when they read two conflicting documents about medical issues written by different experts. We varied the evidence (a single study presented in detail, a review of studies, and a review of studies with a detailed explanation of one study) in one document, and presented opposing evidence (always one detailed study) in a second document. The documents' order was counterbalanced according to the position taken. We found that undergraduates tend to value the expertise and benevolence of the author who cited only a single study instead of a review of studies. Furthermore, the students preferred the position of the first document, regardless of which position it took. Students did not prefer positions supported by reviews over positions supported by single studies. Thus, educators need to design more effective instruction to prepare people to consider larger bodies of evidence (e.g., reviews) over single studies.

Students' Metacognitive Understanding of Apt Epistemic Performance in Science
Keywords: Cognitive Skills and Processes, Metacognition, Reasoning, Science Education
Presenting Author: Huma Hussain-Abidi, Rutgers University Graduate School of Education, United States; **Co-Author:**Clark Chinn, Rutgers University Graduate School of Education, United States; **Co-Author:**Kyle Hunker, Rutgers Graduate School of Education, United States; **Co-Author:**Susan Yoon, University of Pennsylvania, United States; **Co-Author:**Noora Noushad, University of Pennsylvania, United States; **Co-Author:**Thomas Richman, University of Pennsylvania, United States; **Co-Author:**Amanda Cottone, University of Pennsylvania, United States

To combat the perilous nature of the "post-truth" era, where misinformation is rampant, science education must change. One way to prepare students to evaluate scientific information is to promote apt epistemic performance in the classrooms. In this study, we aim to analyze various students' metacognitive knowledge from focus group interviews to provide a portrait of students' understandings of ideals and reliable processes for developing scientific knowledge. Our findings suggest that not only do students have metacognitive knowledge of a wide range of ideals and reliable processes, but they also can critique other students and themselves for using less reliable processes as they engage in science inquiry.

Session U 12

26 August 2023 16:30 - 18:00
AUTH_T202
Single Paper
Instructional Design

Simulation-based Learning in Vocational Education

Keywords: Health-care Education, Higher Education, Instructional Design, Qualitative Methods, Simulation-based Learning, Social Aspects of Learning and Teaching, Vocational Education and Apprenticeship Training
Interest group: SIG 14 - Learning and Professional Development
Chairperson: Raija Hämäläinen, University of Jyväskylä, Finland

Measuring the Collaborative Diagnostic Problem Solving Process in Automotive Malfunction Diagnosis
Keywords: Higher Education, Simulation-based Learning, Social Aspects of Learning and Teaching, Vocational Education and Apprenticeship Training
Presenting Author: Dave Rexhäuser, Technische Universität Dresden, Germany; **Presenting Author:**Stephan Abele, Chair of Vocational Education, Institute of Educational Vocation and Vocational Didactics, Germany; **Co-Author:**Anika Radkowitsch, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**Constanze Richters, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Louise Kaseler, TU Dresden, Germany; **Co-Author:**Peter Hesse, TU Dresden, Germany; **Co-Author:**Inga Glogger-Frey, University of Erfurt, Germany; **Co-Author:**Julius Meier, University Erfurt, Germany

Collaborative diagnostic problem solving (CDPS) is becoming increasingly important in the practice of technical professions. Despite its high practical relevance, CDPS does not play a significant role in vocational education and training. This may be due to a lack of theoretical conceptualizations and empirically tested measurements. We present a theoretically grounded model of CDPS and a computer-based method for measuring the CDPS process in automotive malfunction diagnosis and report results on the reliability of the measurement, characteristics of the process, and their associations with diagnostic accuracy.A total of 64 dyads of automotive mechatronics trainees solved automotive malfunctions in a computer simulation. The trainees took on two different roles with different functions and information available. During the process, text chat transcripts were recorded, subsequently coded and analyzed.In the transcripts, the following diagnostic activities (κ=.85): "generating hypotheses", "generating evidence", "interpreting evidence", and "others" (e.g., small talk) and collaborative activities (κ=.79) "sharing", "eliciting", "coordinating", "negotiating", and "maintaining communication" were found. We found that the frequencies of collaborative activities strongly varies between the diagnostic activities. Analyses showed no significant associations between frequency of activities and diagnostic accuracy. However, detailed analyses showed significant associations between diagnostic accuracy and the exchange of relevant evidence (ρ=.356; p=

How Role Power & Social Persuasion Relate to Self-Efficacy & Performance in a Role-Play Simulation
Keywords: Higher Education, Simulation-based Learning, Social Aspects of Learning and Teaching, Vocational Education and Apprenticeship Training
Presenting Author: Dorothy Duchatelet, Open Universiteit, Department of Online Learning and Instruction, Netherlands; **Co-Author:**Leen Catrysse, Open Universiteit, Department of Online Learning and Instruction, Belgium

Role-play simulations of political decision-making have grown to be the most commonly used active learning method to teach about complex, dynamic political processes. The way that participants enact their role and the simulation process unfolds most certainly shapes participants' learning. Previous work has shown that the outcome of self-efficacy in negotiating largely relates to the emergence of social persuasion during the simulation conduction. This study builds further on this work. It focuses on the mediating role of social persuasion between role power and the outcomes of self-efficacy in negotiating and negotiation performance. After a two-day United Nations-simulation, 74 students completed a survey. Data were analysed by means of structural equation modelling. Results show a mediating role for social persuasion between role power, and both self-efficacy in negotiating and negotiation performance. Remarkably, the relation between role power and negotiation performance disappears after including social persuasion as mediator. Results are discussed with regard to implications for future research and simulation-based learning practice.

Social Experiences During Verbal and Video-Assisted Debriefings
Keywords: Higher Education, Simulation-based Learning, Social Aspects of Learning and Teaching, Vocational Education and Apprenticeship Training
Presenting Author: Stefan Hanus, University of Regensburg, Germany; **Presenting Author:**Helen Jossberger, University of Regensburg, Germany; **Co-Author:**Hans Gruber, University of Regensburg, Germany

Most debriefings after simulations are either conducted verbally or with the help of video playback. While research has concentrated on comparing the learning outcomes, the social experiences during different debriefing modes are not fully explored. However, these experiences are considered important, as they create implications for the successful implementation of debriefings. This study explores the social experiences connected to verbal debriefings (VD) versus video-assisted debriefings (VAD) during simulation training of mountain rescuing. A total of 42 mountain rescuers participated. As part of a within-subject design, participants experienced three debriefing modes: VD, VAD with advanced technical equipment and VAD with simple technical equipment. A qualitative approach was used. Biographical information was collected and focus group interviews with the participants were conducted to gain insights into their perspectives regarding the debriefing modes. Preliminary results indicate that the outside view provided by the VAD helped with the acceptance of feedback from the facilitator. It created positive emotions by being able to find the cause for mistakes that were falsely attributed to oneself before the debriefing. However, VAD also created stress, which led to changes in behaviour during simulation. To benefit from VAD, debriefings have to take place in a safe environment.

Scaffolding in healthcare simulation training
Keywords: Health-care Education, Instructional Design, Qualitative Methods, Simulation-based Learning
Presenting Author: Pauliina Rikala, University of Jyväskylä, Finland; **Co-Author:**Aaron Peltoniemi, University of Jyväskylä, Finland; **Co-Author:**Minna Ruoranen, University of Jyväskylä, Finland; **Co-Author:**Kaisa Silvennoinen, University of Jyväskylä, Finland; **Co-Author:**Raija Hämäläinen, University of Jyväskylä, Finland

Simulation-based training has been shown to be an effective method of training for the demands in clinical healthcare. However, little research has examined scaffolding as an instructional strategy in simulation-based healthcare training. This study focused on scaffolding strategies that involve interaction, discussion, collaboration, and support between trainer and trainees and among trainees. Our aim was to answer the following question: How does scaffolding manifest during healthcare simulation-based training? We examined scaffolding strategies through video-recorded scaffolding episodes (n = 221), in which participants (trainees, n = 27) and instructors (trainers, n = 8) collaborated to make treatment decisions in varying multi-professional, high-fidelity healthcare simulation scenarios. A GoPro camera was used to record interactive and collaborative situations during the simulation training, and we applied theory-based content analysis to assess the data. According to our preliminary results, scaffolding can be understood as tailored interaction and support between the trainer and trainees as well as among trainees, and three categories of scaffolding strategy emerged: i) orientation talk, ii) step forward, and iii) reflection. Our results reinforce the idea that open and cross-border interaction between trainers and trainees during simulation-based training is essential in the learning process. At best, trainee-centred joint reflection during the debriefing highlighted opportunities for improvement. It is challenging, however, to find a balance between trainer-centred and trainee-centred approaches. The structure of the simulation can partly explain trainer-centred discourse; however, the question arises of how to strengthen trainee-centred reflections.

Session U 13

26 August 2023 16:30 - 18:00
AUTH_T102
Single Paper
Motivational, Social and Affective Processes

Math Self-concept

Keywords: Achievement, Emotion and Affect, Gifted and Talented Students, Interest, Large-scale Assessment, Mathematics/Numeracy, Motivation, Peer Interaction, Quantitative Methods, Secondary Education, Self-concept, Self-efficacy
Interest group: SIG 08 - Motivation and Emotion, SIG 17 - Methods in Learning Research
Chairperson: Ana Rodrigues de Lemos, Faculty of Psychology and Educational Sciences of the University of Porto, Portugal

The Implications of Math Self-Concept Decline Among High-Ability and Average-Ability Students
Keywords: Gifted and Talented Students, Quantitative Methods, Secondary Education, Self-concept
Presenting Author: Alicia Ramos, KU Leuven, Belgium; **Co-Author:**Karine Verschueren, KU Leuven, Belgium

This study examined the intra-individual development of math self-concept during the transition to secondary school comparatively among high-ability and average-ability students in a largescale longitudinal sample in Flanders, Belgium (*N*=5,740 students, 49.5% males, Grade 6 to 7). Latent change models revealed that high-ability students, although maintaining higher relative levels of math self-concept, experienced steeper levels of math self-concept decline in the transition to secondary school than their average-ability peers. Cognitive ability predicted steeper math self-concept decline within both ability groups, and in both groups stronger math self-concept decline was associated with higher levels of perceived underachievement, lower standardized math achievement and school well-being, and higher probability of grade repetition by the end of secondary school. These findings establish that not only the level of math self-concept but also the degree in decline in math self-concept can have negative implications for educational outcomes, even when math self-concept level remains high relative to peers.

Mathematics self-concept, self-beliefs, and performance for mid-adolescent New Zealanders
Keywords: Interest, Mathematics/Numeracy, Self-concept, Self-efficacy
Presenting Author: Penelope Watson, University of Auckland, New Zealand; **Co-Author:**Bernhard Ertl, Universität der Bundeswehr, Germany; **Co-Author:**Shengnan Wang, The University of Auckland, New Zealand

Self-beliefs are key to academic performance and career directions. Mathematics self-concept has been positively associated with mathematics self-efficacy, interest, and achievement and the desire to pursue quantitative domains. Large gender differences in mathematics self-beliefs persist, however, with associated differences reflected in underrepresentation of females in mathematics-related careers. How mathematics self-beliefs might be associated with mathematics performance, the role of mathematics self-concept in mediating mathematics self-beliefs and performance, and gendered differences in these associations were explored for mid-adolescents (N = 210) from four New Zealand secondary schools of mid to high socioeconomic level, and comprising a range of ethnicities. Data were collected using the Mathematics Self-Beliefs, and Career Aspirations in Mid-Adolescence Questionnaire. After good model fit was established by confirmatory factor analysis, comparison of latent factor means showed that male students' mathematics interest was significantly higher than female students, and female students' mathematics helplessness (low self-efficacy) was significantly higher male students. A structural equation model revealed that mathematics self-concept fully mediated the positive effect of mathematics interest on mathematics achievement, fully mediated the negative effect of mathematics helplessness on mathematics achievement, partially mediated the positive effect of academic self-concept on mathematics achievement, and that academic self-concept had a direct positive effect on mathematics achievement. Implications are suggested for gendered differences in self-beliefs for mid-adolescent New Zealanders that could impact gendered futures in that country. Overall, the findings hold implications for pedagogy and policy to promote positive mathematics self-beliefs for young New Zealanders, and especially for young New Zealand women.

Becoming a "math-person": Interplay between achievement emotions, motivation and math identity
Keywords: Achievement, Emotion and Affect, Mathematics/Numeracy, Motivation
Presenting Author: Barbara Blažanin, Faculty of Philosophy, University of Belgrade, Serbia; **Presenting Author:**Jelena Radisic, University of Oslo, Norway; **Co-Author:**Ksenija Krstic, University of Belgrade, Serbia; **Co-Author:**Katarina Mićić, University of Belgrade, Faculty of Philosophy, Serbia

An extensive line of research was dedicated to exploring the influence of academic identity on motivation. Still, only a few examined the interplay between

academic identity, motivation, and emotions and their impact on academic achievement, especially among younger students. The present study explores these relationships among eight-, nine- and ten-year-old students. The survey was conducted in the context of the MATHMot project. In the current investigation, we focus on the Serbian subsample, consisting of 437 students. Path analyses were employed to analyse the relationship between motivational beliefs, academic emotions, math identity, and math achievement. The analysis (χ^2/df = 1.544, CFI= .996, TLI=.988, NFI=.990 and RMSEA=.035) confirmed a strong influence of mathematics identity on perceived competence, intrinsic value, extrinsic value and cost and once again established the importance of identity formation for the mathematics domain. Perceived competence and cost influenced anxiety, intrinsic motivation and cost influenced boredom, while enjoyment was affected by intrinsic motivation only.

Peer Spillover and Big-Fish-Little-Pond- Effects with SIMS80: Resolving a Theoretical Paradox?
Keywords: Large-scale Assessment, Peer Interaction, Quantitative Methods, Self-concept
Presenting Author: Ioulia Televantou, European University Cyprus, Cyprus; **Co-Author:**Herbert W. Marsh, Australian Catholic University, Australia; **Co-Author:**Kate Xu, Open University of the Netherlands, Netherlands; **Co-Author:**Jiesi Guo, Australian Catholic University, Australia; **Co-Author:**Theresa Dicke, Australian Catholic University, Australia

Class- or school-level compositional effects are said to be revealed when students' individual outcomes are found to be associated with the composition of their class- or school-mates. The present study estimates the effect of average mathematics achievement at the class-level on students' subsequent mathematics achievement (the *peer spillover effect*) and mathematics self-concept (the *big-fish-little-pond-effect; BFLPE*), controlling for individual differences in prior mathematics achievement and measurement error. Our data, consisting of thirteen-year-old students from Canada, USA, and New Zealand, come from a unique cross-national database with a longitudinal design at the student-level; the Second International Mathematics Study (SIMS80). Using mediational analysis and doubly latent models, we show that when the peer spillover effects are modeled as the sum of a direct and an indirect effect of prior class-average achievement through self-concept, a negative and a statistically significant mediation is shown. This indicates that BFLPEs and peer spill over effects might not operate independently.

Session U 14

26 August 2023 16:30 - 18:00
UOM_R05
Single Paper
Learning and Instructional Technology, Motivational, Social and Affective Processes

Social Media: Learning, Anxiety and Stress

Keywords: Anxiety and Stress, E-learning/ Online Learning, Lifelong Learning, Misconceptions, Motivation, Quantitative Methods, Social Media, Well-being
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 08 - Motivation and Emotion
Chairperson: Alexandra Gkloumpou, Aristotle University of Thessaloniki, Greece

A gamified approach to examining health literacy and information sharing among ethnic populations
Keywords: E-learning/ Online Learning, Lifelong Learning, Misconceptions, Social Media
Presenting Author: Giovanna Morara, University of South Carolina, Italy; **Presenting Author:**Shea Ferguson, University of South Carolina, United States; **Co-Author:**Melissa Duffy, University of South Carolina, United States; **Co-Author:**Gregory Trevors, University of South Carolina, United States

Health literacy is an important set of skills and knowledge fundamental to effectively navigating online information and has been linked to health outcomes. However, there is increasing concern about health disparities across ethnic and racial groups, which may be linked to gaps in effective communication of health information. Identifying existing health misconceptions is a critical step in reaching more diverse groups to increase health literacy. In this study, we used a digital gamified platform designed to share health information and identify misconceptions about COVID-19. Health misconceptions, knowledge retention, and knowledge share intent and behavior were examined among Black, White and Hispanic/Latino US adult participants (total N=13,479). Results demonstrated differences in baseline knowledge, indicating that within our sample, Black participants reported relatively more misconceptions. However, share intent and behavior was also more frequent among Black participants and there were no differences in retention across groups. The findings provide insights into key areas to address in future educational interventions designed to share health information and combat misconceptions more effectively among diverse communities. Information about sharing behavior can also help by building upon existing assets in health literacy within marginalized communities.

Reasons and consequences for media multitasking during studying – an experience sampling approach
Keywords: Anxiety and Stress, Motivation, Quantitative Methods, Social Media
Presenting Author: Lauri Hietajärvi, University of Helsinki, Finland; **Co-Author:**Erika Maksniemi, University of Helsinki, Finland; **Co-Author:**Jussi Järvinen, University of Helsinki, Finland; **Co-Author:**Elina E. Ketonen, University of Helsinki, Finland; **Co-Author:**Kirsti Lonka, University of Helsinki, Finland; **Co-Author:**Katariina Salmela-Aro, Helsinki University, Finland

Media multitasking (MMT) while studying may be distracting for learning and related to negative study-related outcomes. This one-way conceptualization is, however, limited. Behavioral exploitation-exploration cycle means that students switch back and forth between studying (*exploitation*) and social media (*exploration*) because the two different tasks provide different kinds of rewards. The present study investigates this cycle in a moment-to-moment setting by means of Experience sampling method (ESM). We analyze how study task value (perceived interest, importance and utility) is associated with momentary MMT while studying, and how MMT relates to self-reported concentration and relaxation. Data from (N=119) students (aged 17-18, 69% female) were collected via two-week ESM study, consisting of 1337 momentary measures when students were studying. Linear mixed models showed that task duration and lower interest were related to a higher likelihood of MMT, whereas task importance or utility had no effect. In addition, MMT was related to lower self-reported concentration and lower relaxation at the given moment. The results suggests that when studying was not experienced instantly rewarding students were more likely to seek stimulus from MMT. .Furthermore, MMT was negatively related to reported concentration and relaxation, indicating that either MMT has a detrimental effect on concentration and relaxation, or that MMT occurs more likely when concentration is waning and relaxation is needed. Future studies should examine direction of these effects as well as the longitudinal consequences of MMT for academic achievement. As digital environments continue to expand, students need skills in how to regulate their own digital practices.

Is experience of digital stress more harmful for schooling than social media use before bedtime?
Keywords: Anxiety and Stress, Quantitative Methods, Social Media, Well-being
Presenting Author: Erika Maksniemi, University of Helsinki, Finland; **Co-Author:**Elina E. Ketonen, University of Helsinki, Finland; **Co-Author:**Kirsti Lonka, University of Helsinki, Finland; **Co-Author:**Reito Visajaani Salonen, Helsinki Institute for Social Sciences and Humanities, University of Helsinki, Finland; **Co-Author:**Katariina Salmela-Aro, Helsinki University, Finland

Social media use has been claimed to delay adolescents' bedtimes and influence academic functioning, but longitudinal evidence is still rather scarce. Therefore, this longitudinal and multi-informant study aims to investigate how interactive (i.e. chatting with friends) and passive (i.e., scrolling content) social media use close to bedtime, perceived social demands to stay constantly available online, and socio-digital stress related to these availability demands are associated with objective bedtimes, and tiredness and stress at school. We conducted a two-week ESM study with N=141 students (aged 17-18, 71% female, N=2735 daily measures collected by smartphones five times a day). Objective bedtimes were measured with activity bracelets. Evening interactive and passive social media use were categorized based on open-ended answers from the students. Multilevel models were conducted and showed that earlier bedtimes were measured on those evenings' students reported interactive social media use. However, students who reported more availability demands were measured, on average, with later bedtimes. Students who reported more socio-digital stress were, on average, more tired and stressed during schooldays. Our results pointed out that social media use per se (interactive or passive) was not as harmful as the availability demands or socio-digital stress. Therefore, research should move

forward by investigating the practices of social media that increase daily stress and tiredness, and to find out which adolescents are more susceptible to delayed bedtimes due to social media use. Students need to develop social and emotional skills to handle the social demands that occur due to different social media practices.

Session U 15

26 August 2023 16:30 - 18:00
UOM_A11
Single Paper
Developmental Aspects of Instruction, Higher Education

Critical Thinking in Higher Education

Keywords: Cognitive Skills and Processes, Critical Thinking, Higher Education, Metacognition, Parents' Beliefs and Affect, Quantitative Methods, Reasoning, Researcher Education, Synergies between Learning / Teaching and Research
Interest group: SIG 04 - Higher Education, SIG 17 - Methods in Learning Research
Chairperson: Minna Törmänen, Switzerland

Associations of critical thinking with educational and socioeconomic background of Finnish students
Keywords: Critical Thinking, Higher Education, Parents' Beliefs and Affect, Quantitative Methods
Presenting Author: Heidi Hyytinen, University of Helsinki, Finland; **Co-Author:**Kari Nissinen, University of Jyväskylä, Finland; **Co-Author:**Katri Kleemola, University of Helsinki, Finland; **Co-Author:**Jani Ursin, University of Jyväskylä, Finland

The present study aims to explore how final-stage undergraduate students' critical thinking is associated with educational and socioeconomic background. The data were collected in 18 higher education institutions in Finland. Participants were 744 final-stage undergraduate students, of which 631 had a general upper secondary degree and 113 had a vocational qualification as a background degree. An open-ended performance task of CLA+ was used to assess three measures of critical thinking: analysis and problem solving, writing effectiveness, and writing mechanics. Self-report questionnaire was used to collect demographic data, including educational and socioeconomic background. The interrelations of the variables were analyzed with the path analysis. Students' educational and socioeconomic background, especially number of books in the childhood home, had important effect on the level of critical thinking at the final stage of undergraduate degree. The pedagogical implications include considering how higher education could better promote equality in students' educational path.

Promoting university students´ scientific thinking development: a perspective of university teachers
Keywords: Critical Thinking, Higher Education, Metacognition, Researcher Education
Presenting Author: Mari Murtonen, University of Turku, Finland; **Co-Author:**Heidi Salmento, University of Turku, Department of Teacher Education, Finland

Scientific thinking is at the heart of university education in all disciplines. We conducted focus group interviews to explore 1) how university teachers (N = 11) think that the development of students´ scientific thinking should be promoted and 2) how they aim to facilitate students´ epistemic growth, which forms a fundamental part of scientific thinking. A data driven content analysis revealed that from teachers´ viewpoint, students´ scientific thinking should be supported more explicitly, there should be more collaboration between teachers and more attention should be paid to scientific thinking in curriculum work. Additionally, supporting the development of scientific thinking requires pedagogical skills and recourses. Metacognitive monitoring of students´ thinking showed to be the most central way to facilitate their epistemic growth. Our findings highlight that more attention should be paid to explicitly supporting the development of students ´ scientific thinking and teachers´ pedagogical skills to do so.

Cognitive in context: How course-taking breadth supports skill formation in emerging adults
Keywords: Cognitive Skills and Processes, Critical Thinking, Higher Education, Reasoning
Presenting Author: Gabe Orona, University of Tübingen, Germany

Theories of cognitive development among emerging adults posit that environmental and age-related influences are responsible for individual differences in complex reasoning abilities. Exposure to and engagement with a diverse set of ideas and perspectives is stipulated to provide a context for which individuals are positioned to coordinate, integrate, and form new abstractions. This notion is implicit in the general education and elective requirements of university programs. In this study, we draw upon the cognitive psychology literature on emerging adult development to examine how intellectual breadth via course-taking patterns relates to gains in cognitive skills. Using recently collected longitudinal data of undergraduates enrolled at a large public university, we leverage a unique set of cognitive measures that tap a string of related constructs. We find moderate associations between intellectual breadth and reasoning skills, with notable differences across cognitive dimensions. Additionally, intellectual curiosity moderates the association between course breadth and cognition. Implications for theories of intellectual development are discussed in relation to undergraduate experiences.

Characteristics, Context, and Conditions: A Systematic Review of Critical Thinking Interventions
Keywords: Critical Thinking, Higher Education, Reasoning, Synergies between Learning / Teaching and Research
Presenting Author: Eric Schoute, University of Maryland, United States

Within education writ large, critical thinking (CT) is touted as the hallmark of learning, and much research and practitioner effort is directed toward the promotion of this skill. Yet, the mechanisms by which CT can be improved among students remain largely inconclusive, and the majority of studies yield non-significant changes. This systematic review sought to scrutinize extant interventions and unearth the characteristics of the participants and study, the context of the intervention, and the conditionalities under which CT is positively promoted. Some crucial theoretical and methodological issues are identified in included literature. For one, although some foundational CT research has forwarded consensus conceptualizations (e.g., Facione, 1990), CT interventions seldom forward clear conceptualizations of the very thing they set out to bolster, clouding what the targeted construct in the intervention is. For another, researchers conducting experiments do not operationalize CT in accordance with their (implicit) conceptualization, making for poor construct validity that perhaps explains nonsignificant CT yields. Alternatively, researchers do not have a clear rationale for the mechanism by which their intervention should improve CT. Lastly, few studies employ robust (quasi-)experimental designs. Most CT interventions included suffer from at least one of these issues, and recommendations for robust CT interventions are forwarded.

Session U 16

26 August 2023 16:30 - 18:00
AUTH_T002
Single Paper
Developmental Aspects of Instruction, Learning and Instructional Technology, Teaching and Teacher Education

Artificial Intelligence in Schools

Keywords: Achievement, Artificial Intelligence, Developmental Processes, Digital Literacy and Learning, Educational Technologies, Immersive Technologies for Learning, Inquiry Learning, Learning Analytics, Pre-service Teachers, Primary Education, Secondary Education, Synergies between Learning / Teaching and Research, Tool Development
Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 17 - Methods in Learning Research
Chairperson: Alex Barrett, Florida State University, United States

Teachers' and parents' attitudes towards the use of AI technology in school

Keywords: Artificial Intelligence, Educational Technologies, Learning Analytics, Primary Education
Presenting Author: Janne Paula Mesenhöller, University of Potsdam, Germany; **Co-Author:**Katrin Böhme, University of Potsdam, Germany

Students in primary schools differ greatly in their individual learning prerequisites. Hence, classes are characterised by a high degree of heterogeneity (Lazarides & Chevalère, 2021; Warwas et al., 2011). New technologies, such as adaptive learning apps, that are based on artificial intelligence (AI) offer new opportunities to deal with this diversity. However, *acceptance* of those systems is an important precondition for the use of new technologies in education (Nistor, 2020). Thus, in the present study we investigated the social acceptance (SA) of AI-based learning apps for the use in schools by 141 teachers and 223 parents in Germany. We used the newly developed questionnaire *ELEKIS*, which is based on the well validated Technology Acceptance Model (TAM) by Davis et al. (1989). Contrary to previous assumptions SA for both groups was shown to be relatively high on a four-point Likert scale ($\bar{x}$ teachers = 2.96, SD = .53, $\bar{x}$ parents = 2.94, SD = .65). Additionally, two open-ended items probed teachers' and parents' concerns regarding the use of AI in schools, as well as the information they would need to successfully implement AI in schools. Based on these results an information workshop called *More information on the use of AI in schools*will be designed to provide basic information on the topic of AI and to further outline realistic potentials and limits.

Preservice teacher discourse with AI-integrated virtual students: A look at sentence function
Keywords: Artificial Intelligence, Educational Technologies, Immersive Technologies for Learning, Pre-service Teachers
Presenting Author: Alex Barrett, Florida State University, United States; **Co-Author:**Chih-Pu Dai, Florida State University, United States; **Co-Author:**Luke West, Florida State University, United States; **Co-Author:**Saptarshi Bhowmik, Florida State University, United States; **Co-Author:**Nuodi Zhang, Florida State University, United States; **Co-Author:**Fengfeng Ke, Florida State University, United States

Artificial intelligence (AI) and virtual simulations are becoming increasingly powerful tools in education. This paper reports on a case study involving eight preservice teachers who engaged with AI-integrated virtual students in a simulated middle-school science and math classroom. Transcripts of the teacher-student discourse, containing over 12,000 words, were analyzed and coded by sentence function. Results indicated high frequencies of declarative and interrogative sentences and very few imperative and exclamatory sentences. Patterns of declarative and interrogative sentence use emerged which appear to reflect the behaviors of real teacher-student interactions. This likely afforded the preservice teachers with valuable teaching practice in a low-risk and low-cost setting. Comparing participant dialogues showed how certain discourse strategies influence the virtual students to behave in a knowledge-seeking fashion. These findings support the use of AI-integrated virtual students and simulation-based teaching practice in preservice teacher training. The findings can help teacher trainers to better coach preservice teachers in their classroom discourse.

Chatting with the past, developing a chatbot for history education
Keywords: Digital Literacy and Learning, Inquiry Learning, Synergies between Learning / Teaching and Research, Tool Development
Presenting Author: Albert Logtenberg, ICLON-Leiden University Graduate School of Teaching, Netherlands; **Co-Author:**Nadira Saab, Leiden University, Netherlands; **Co-Author:**Ron Pat-El, Open University, Netherlands

Chatbots are an increasingly popular tool in education and are commonly used as basic teacher assistants or tutors. Even though chatbots have found their way into educational contexts, little is known about how chatbots can facilitate the learning process or how teachers and students can be involved in the implementation of chatbots in learning. In this project we developed and implemented a chatbot in cooperation with the National Museum of Antiquities in which the chatbot simulated a person from antiquity, a Roman girl called *Caetennia*. The aim is to investigate how students and teachers interact with a chatbot. We designed, implemented, and evaluated a learning task in which secondary students provided content for the chatbot by studying provided texts concerning the relevant historical context. In cooperation with university students this content was used to develop a prototype of the chatbot that is tested with students in lower levels in secondary education and with museum visitors. Students formulated mainly descriptive questions. This resulted in a chatbot that simulates a question-and-answer type conversation with someone from the past which can be used inside and outside the museum. The next step will be implementing the chatbot in museum lessons and at schools in a way that support students in formulating more elaborate historical questions.

Using Machine Learning to Understand how the Predictors of Maths Ability Change over Time
Keywords: Achievement, Artificial Intelligence, Developmental Processes, Secondary Education
Presenting Author: Rosa Lavelle-Hill, University of Copenhagen, Denmark; **Co-Author:**Stephanie Lichtenfeld, Universität Hamburg, Germany; **Co-Author:**Reinhard Pekrun, University of Essex, United Kingdom; **Co-Author:**Michiko Sakaki, University of Tübingen, Germany; **Co-Author:**Kou Murayama, University of Tübingen, Germany

A number of panel studies employ psychological concepts measured using large scale surveys to predict students' achievement. However, few studies use such longitudinal data to understand how the relative importance of different predictors change over time. In this study, we employ a machine learning approach to enable the modelling of 104 variables simultaneously, in order to comparatively assess the change in different features' (or groups of features') utility at predicting next years' maths achievement scores for German secondary school students (N=3,425). We found that maths achievement can be predicted one year ahead statistically significantly better than a mean baseline model (always predicts the mean of the training set), with prediction R squared ranging from 0.68 to 0.77. The survey data (motivation, emotion, expectations, maths self-concept, demographics, cognitive strategies, and reports on classroom and home environments), school grades, and cognitive tests (IQ) together added an additional 0.03-0.10 R squared, beyond students' current ability scores, with the contribution getting less over time. The feature importance results confirmed that current maths ability increases in importance as students progress through the schooling years. Conversely, features measured using the survey and cognitive tests, such as IQ, classroom environment, grades, and psychological concepts became less predictive over time. These findings are interpreted and discussed in relation to schools promoting increased specialisation and testing as students get older.

Session U 17

26 August 2023 16:30 - 18:00
UOM_A03
Single Paper
Cognitive Science, Instructional Design, Teaching and Teacher Education

Eye Tracking Studies on Teaching

Keywords: Classroom Management, Cognitive Skills and Processes, Eye Tracking, Instructional Design, Metacognition, Multimedia Learning, Pre-service Teachers, Reasoning, Simulation-based Learning, Social Sciences and Humanities, Teacher Professional Development
Interest group: SIG 06 - Instructional Design, SIG 11 - Teaching and Teacher Education, SIG 27 - Online Measures of Learning Processes
Chairperson: Aline Alves-Wold, University of Stavanger, Norway

Expertise in interpreting historical images: An eye-tracking study
Keywords: Cognitive Skills and Processes, Eye Tracking, Reasoning, Social Sciences and Humanities
Presenting Author: Marjaana Puurtinen, University of Turku, Finland; **Co-Author:**Johanna Kaakinen, University of Turku, Finland; **Co-Author:**Halszka Maria Jarodzka, Open Universiteit, Department of Online Learning and Instruction, Netherlands

Research on visual expertise has a longish tradition in domains such as chess, sports, or medicine, but studies on visual expertise in history have been hitherto overlooked. This study begins to bridge eye-tracking studies on visual expertise with expertise research in history. We ask: during interpretation of historical images, are eye movements affected by (RQ1) history expertise and/or (RQ2) task performance, and if so, how? 38 adults with a university history degree and 36 adults without such a degree inspected series of three historical images on a computer screen. They were tasked with writing down a topic for each series. Each image appeared for four seconds, and participants' eye movements were recorded with a Tobii X3-120 eye tracker. Two-way repeated measures ANOVA tests showed no differences in the average fixation durations or first fixation durations between the viewing of images. However, in terms of the number of

fixations, participants with a history degree tended to inspect the last images of the series with more fixations than those without a degree. In the final modeling that will address RQ1 and 2 in full, the last images might prove a useful starting point for examining potential interactions between eye-movement measures, domain expertise, and task performance (the latter as reflected in participants' written responses). With little prior empirical research on visual expertise in history, the study hopes to contribute to current theoretical discussions on characteristics of expertise both on general and domain-specific level.

Promoting Professional Vision through Minimal Intervention: An Eye-Tracking Study
Keywords: Eye Tracking, Instructional Design, Pre-service Teachers, Teacher Professional Development
Presenting Author: Sylvia Gabel, Universität Augsburg, Germany; **Co-Author:**Andreas Gegenfurtner, University of Augsburg, Germany

Professional vision as a key competency in the teaching profession requires high attention and is often challenging for pre-service teachers. Disturbing situations are one of many challenges teachers are confronted with, where quick and accurate perception is needed. Implementing videos in pre-service teacher programs are effective formats for developing teacher professional vision. Based on previous investigations that tested the effectiveness of minimal interventions to support professional vision and classroom management competencies of pre-service teachers, this study explored whether providing specific task instructions before watching the video or providing prompts during the video makes a difference in terms of noticing classroom management situations. A pilot study analyzed this minimal intervention with a sample of 85 pre-service teachers with respect to the number, accuracy, and velocity of identified classroom management situations. In a mixed method approach, participants were asked to click a button when they perceived a classroom management-relevant situation in the video. Afterwards, they explained in an interview why they considered these situations as relevant. *T*-tests revealed that both interventions tended to produce a similar attention-guiding effect on noticing. In a future study, we aim to replicate these findings using eye tracking methodology to examine the number of fixations, time to first fixation, and perceptual relevance. Results will be presented in the conference. Implications for educational and empirical practice about using videos in university courses and their instructional setting are discussed.

Did I see it all? - Prompting Preservice Teachers' Noticing During Teaching
Keywords: Classroom Management, Eye Tracking, Pre-service Teachers, Simulation-based Learning
Presenting Author: Leonie Telgmann, Leibniz University Hannover, Germany; **Co-Author:**Katharina Mueller, Leibniz University Hannover, Germany

Being able to notice events related to classroom management next to managing a classroom effectively is regarded a crucial and challenging skill of beginning and expert teachers. In a quasi-experimental between-subject design we explore, how a classroom management training together with cognitive prompting might help pre-service teachers' (PST) to activate classroom management knowledge and identify related events while teaching. PSTs (N=24) took part in a standardized classroom simulation, after one group received prompting and one group received no prompting. To assess differences in PSTs' noticing, we differentiate between slight and salient classroom events while controlling for count, time and saliency over participating PSTs. For the assessment of noticing, we use trained observers coding of PSTs' gaze videos, recorded with mobile eye tracking and PSTs' retrospective commentaries. With that, the results allow new insights into perceptual processes during teaching and provide possibilities to investigate and possibly promote noticing skills in teacher education.

Disfluency as Moderator for the Seductive Details Effect: An Eye-Tracking Investigation
Keywords: Eye Tracking, Instructional Design, Metacognition, Multimedia Learning
Presenting Author: Sophia Christin Weissgerber, University of Kassel, Germany; **Co-Author:**Ralf Rummer, University of Kassel, Germany

Non-informative content such as seductive details distract the learner's attention from the essential and relevant learning content (attention-distraction hypothesis). Research on perceptual disfluency suggest that harder-to-read fonts can shield against distraction by focusing attention on the learning material (attention-binding hypothesis). The present experiment is the first to test whether a text written in a disfluent font can reduce the detrimental effect of dynamic seductive details on learning. Moreover, the present experiment is the first to directly test the attention-binding hypothesis of disfluent fonts by adopting eye-tracking as measure of attentional processes. 130 psychology students learned a short expository text, either in Arial or Sans Forgetica, which was either accompanied by short videos or not (2 x 2 between-subjects). The preliminary analysis on a subset of the sample (n = 39) show (descriptively) that participants spend less time looking at the seductive videos in the disfluent condition than in the fluent condition. Moreover, participants spent more time on the text in the disfluent condition that in the fluent condition when seductive details were displayed. The present trend is consistent with the attention-binding hypothesis of disfluent fonts and shows the potential of disfluency as promising moderator for the seductive details effect.

Session U 18

26 August 2023 16:30 - 18:00
UOM_R02
Poster Presentation
Assessment and Evaluation, Higher Education, Learning and Instructional Technology, Motivational, Social and Affective Processes

Game-based Learning and Immersive Technologies in Studying Learning, Instruction and Motivation

Keywords: At-risk Students, Attitudes and Beliefs, Cognitive Development, Computer-assisted Learning, Educational Technologies, Emotion and Affect, Game-based Learning, Higher Education, Immersive Technologies for Learning, Pandemic, Primary Education, Problem-based Learning, Reading, Resilience, Science and STEM, Science Education, Self-efficacy, Sustainable Development
Interest group: SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 08 - Motivation and Emotion
Chairperson: Therese Hopfenbeck, University of Melbourne, Australia

In-game performance and the role of students' socioeconomic status, self-efficacy and interest
Keywords: At-risk Students, Game-based Learning, Immersive Technologies for Learning, Self-efficacy
Presenting Author: Michaela Arztmann, Utrecht University, Netherlands; **Co-Author:**Jessica Lizeth Domínguez Alfaro, KU Leuven - University of Leuven, Belgium; **Co-Author:**Lisette Hornstra, Utrecht University, Netherlands; **Co-Author:**Johan Jeuring, Utrecht University, Netherlands; **Co-Author:**Liesbeth Kester, Utrecht University, Netherlands

Digital games are widely used in education to motivate students for science. Additionally, technological advances in immersive learning environments, such as augmented reality (AR), provide new opportunities in education. However, it is unclear whether these technologies are equally beneficial for students with different background characteristics. Students with different backgrounds may differ in their self-efficacy and interest when playing games, and this may lead to differences in performance. Given the widespread use of games in education, it is important to gain a better understanding of the effectiveness of games for different student groups. Moreover, log-data in games can provide valuable insights into individual behavior and are increasingly used in research to predict learning outcomes. This study focused on the role of students' socioeconomic status (SES) and examined whether SES was associated to in-game performance and whether interest and self-efficacy mediated potential associations between SES and in-game performance. In total, 279 early secondary school students participated in this study. The results indicate that SES has no direct or an indirect effect through self-efficacy and interest on in-game performance. However, lower self-efficacy did increase the likelihood to drop-out of the game. These findings indicate that students from different socioeconomic backgrounds are equally interested and self-efficacious while playing the game and that their performance is not affected by their background. The affordances of AR as an immersive learning environment might be motivating enough to help mitigating possible SES differences in students' performance.

PandHEMOT®: An App for Children and Adolescents to Foster Pandemic-Related Emotional Competence
Keywords: Emotion and Affect, Game-based Learning, Pandemic, Resilience
Presenting Author: Giada Vicentini, University of Verona, Italy; **Co-Author:**Daniela Raccanello, University of Verona, Italy; **Co-Author:**Emmanuela Rocca, University of Verona, Italy; **Co-Author:**Roberto Burro, University of Verona, Italy

Pandemics are biological natural disasters that can have a traumatic impact on children and adolescents' wellbeing. Recent metanalyses have well documented the consequences of the COVID-19 pandemic in terms of psychopathological symptoms. To promote children and adolescents' resilience and foster their

emotional competence concerning the pandemic, we developed the psychoeducational app PandHEMOT® (Pandemics – Helmet for EMOTions), as part of a larger project. In this study, we tested the efficacy of a training using PandHEMOT® aiming at increasing children and adolescents' knowledge and metacognitive awareness about pandemics, emotions, and emotion regulation strategies, also investigating class level differences. Moreover, we explored changes in participants' wellbeing for ethical issues. We involved a sample of 65 third and 82 seventh-graders from Northern Italy, divided into an experimental and a control group. The experimental group participated to a three-unit training using PandHEMOT®; both groups filled in pretest and posttest questionnaires. Our findings indicated that participants belonging to the experimental group increased their knowledge and metacognitive awareness about the training contents, with adolescents performing better than children. In addition, participating to the training did not affect wellbeing. On the whole, we documented the efficacy of PandHEMOT® following the standards of evidence-based research. Notwithstanding some limitations, this study expanded knowledge about the possibility to use digital activities for promoting disaster-related learning with children and adolescents. It is also a valid example for developing other psychoeducational tools to foster emotional competence to cope with both possible future disasters and everyday life tasks.

"Try to contaminate patients and objects": Effects of discovery instructions in VR
Keywords: Computer-assisted Learning, Game-based Learning, Higher Education, Immersive Technologies for Learning
Presenting Author: Juliette Desiron, University of Zürich, Switzerland; **Co-Author:**Aline Wolfensberger, Department of Infectious Diseases and Hospital Epidemiology, University Hospital Zurich, Switzerland; **Co-Author:**Dominik Petko, University of Zurich, Switzerland

In this study we investigated the effect of prompts when training to moments to perform hand hygiene, with a focus on learning from your mistakes. In line with previous research in non-immersive training environments, we expected a positive effect of prompting participants to contaminate patients and objects on later performance, but a negative effect on their sense of presence. Further, we investigated predictors of sense of presence (feeling of being there and of realism), including prompts as well as engagement, technology acceptance, and play habits. 178 first-year medical students participated as part of a seminar on infection prevention. Data analyses are ongoing.

Online intervention program for first graders to close pre-reading skills gaps
Keywords: Cognitive Development, Game-based Learning, Primary Education, Reading
Presenting Author: Renáta Kiss, University of Szeged Institute of Education, MTA-SZTE Digital Learning Technologies Research Group, MTA-SZTE Research Group on the Development of Competencies, Hungary; **Co-Author:**Katalin Szili, Hungarian University of Agriculture and Life Sciences, Institute of Education, Hungary; **Co-Author:**Dora Mokri, Szeged Center for Research on Learning and Instruction!, Hungary; **Co-Author:**Benö Csapó, University of Szeged, Hungary; **Co-Author:**Gyöngyvér Molnár, University of Szeged, MTA-SZTE Digital Learning Technologies Research Group, Hungary

A lack of foundational pre-reading skills may cause reading and learning problems, therefore early diagnosis and development is essential. In recent years, increasing attention has been paid on the need of targeted improvement. The aim of this study is to develop a valid and widely usable online intervention program that does not require the continuous presence of a teacher. In this paper we present the direct results as well as the longitudinal effects of an online training program prepared for developing pupils' pre-reading skills. Participants in the quasi-experimental study were 306 first-grade students. Propensity score matching was used for examining the efficiency of the intervention. As a result, the intervention group developed significantly (Cohen's d=.52). The most noticeable development was found among students in the lower third skill group (Cohen's d=.99). The study provided evidence that a well-designed online intervention program can prevent learning gaps in pre-reading skills even at this early stage, without the presence of the teacher, even in disruptive times as well as directs attention to the continuity of the development of pre-reading skills.

Addressing the Climate Crisis in Higher Education: Game Design for Transformative Learning
Keywords: Attitudes and Beliefs, Game-based Learning, Higher Education, Sustainable Development
Presenting Author: Pia Spangenberger, Universität Potsdam, Germany; **Co-Author:**Linda Kruse, Hochschule Mainz / University of Applied Sciences, Germany; **Co-Author:**Anja Schultze-Krumbholz, Technische Universität Berlin, Department of Educational Psychology, Germany; **Co-Author:**Mandy Singer-Brodowski, Freie Universität Berlin, Germany

Transformative learning describes a methodological approach in the concept of education for sustainable development to equip the upcoming generation with competencies to cope with the climate crisis. In our current study we investigate the question on how designing a serious game as a seminar concept in higher education can foster transformative learning. We conducted a pretest-posttest study-design (n=40) investigating the effects of a game-design seminar on students' understanding of sustainable development, students' critical reflection concerning own values and on pro-environmental behavior. Based on our results, we will discuss the potential of serious game design as didactical approach for transformative learning.

Design, Development and Implementation of VR Serious Games for Science in a Postsecondary Context
Keywords: Game-based Learning, Higher Education, Immersive Technologies for Learning, Science and STEM
Presenting Author: Christine Marquis, Cégep de Saint-Jérôme, Canada; **Presenting Author:**Bruno Poellhuber, University of Montreal, Canada; **Co-Author:**Sébastien Wall-Lacelle, Cégep de Saint-Jérôme, Canada; **Co-Author:**Audrey Groleau, Université du Québec à Trois-Rivières, Canada; **Co-Author:**Normand Roy, University of Montreal, Canada

In order to find active methods that can engage students and counter the declining interest in science, we relied on an educational value research-development framework to develop and test VR serious games for science courses offered in colleges in Quebec. We thoroughly documented each step of the process, as well as the result of each phase. The pre-design phase relied on a questionnaire, a comparative analysis of existing VR science learning applications and a review of the literature about the advantages and pitfalls of VR, as well as the main design and development models in the field. The functional analysis phase made use of comparative analysis through the nominal group process and led to a quality criteria grid for VR serious games for science. This grid was the starting point of the design and development phase, in which disciplinary teams brainstormed and discussed until a specific scenario was chosen for each discipline. In the development phase, a very detailed storyboard was elaborated for each scenario, and a science teacher led a student team that iteratively developed prototypes. In the last phase, the final prototypes were tested and evaluated by students in biology and chemistry classes in fall 2022.

From Awareness to Adjustment: A Teacher's Local Adaptation of a Game-based Learning Environment
Keywords: Educational Technologies, Game-based Learning, Problem-based Learning, Science Education
Presenting Author: Tianshu Wang, Indiana University, United States; **Co-Author:**Krista D. Glazewski, Indiana University, United States; **Co-Author:**Haesol Bae, Indiana University, United States; **Co-Author:**Chen Feng, Indiana University, United States; **Co-Author:**Daeun Hong, Indiana University, United States; **Co-Author:**Cindy E. Hmelo-Silver, Indiana University, United States; **Co-Author:**Seung Lee, North Carolina State University, United States; **Co-Author:**Bradford W. Mott, North Carolina State University, United States; **Co-Author:**James C. Lester, North Carolina State University, United States

With the involvement of mutually connected variables and dynamic situations, complex problem-solving practices can represent one way for teachers to meet priorities in authentic and disciplinary learning. Problem-based learning (PBL) is an ideal pedagogical model and context to embed content knowledge within the problem-solving of ill-structured tasks. Game-based learning environments can provide a rich, interactive context for students to engage in the PBL process. However, embedding a game-based learning environment in the classroom can add additional variables to the interaction among teachers, students, and the game. In this case study, we explore a middle school science teacher's adaptation of a game-based learning environment into a local classroom during an implementation. The study focuses on the reason, steps, and types of adaptation.Keywords: Teacher Adaptation, Game-based Learning, K-12, Science and STEM, Classroom Implementation, Problem-based Learning

Session U 19

26 August 2023 16:30 - 18:00
UOM_R01
Poster Presentation

Cognitive Science, Culture, Morality, Religion and Education, Lifelong Learning, Motivational, Social and Affective Processes

Gender Issues in Education

Keywords: Citizenship Education, Cognitive Skills and Processes, Computational Thinking, Critical Thinking, Dialogic Pedagogy, E-learning/ Online Learning, Gender Issues, Meta-analysis, Migrant / Refugee and Minority students, Motivation, Pandemic, Primary Education, Resilience, Science Education, Self-efficacy
Interest group: SIG 08 - Motivation and Emotion, SIG 13 - Moral and Democratic Education, SIG 18 - Educational Effectiveness and Improvement
Chairperson: Lisa Dewulf, Ghent University, Belgium

Global crisis and increase in domestic violence. Education as a force for change
Keywords: Citizenship Education, Gender Issues, Pandemic, Resilience
Presenting Author: Rossella Marzullo, University of Reggio Calabria Mediterranea, Italy

Time of crisis we are going through - aggravated by the effects of the pandemic and by the after-effects it has caused - is the plastic testimony of human relations and civil coexistence deterioration: prosocial behaviors have drastically decreased and thoughts, words and actions of hate have grown in a directly proportional manner. Within this scenario, women and minors continue to be the first victims of violence, so it seems urgent to rekindle a light on those pains that too often end up being submerged, relegated to "private affairs", considered minor compared to major emergencies, but which, conversely, have found in COVID-19 the breeding ground to proliferate and manifest themselves in all their dangers. This leads us to consider it essential to strengthen the life skills training system, coping strategies, resilience, which have the ability to provide individuals with the necessary tools to manage the transitions in progress, the tumultuous changes of our time and disorientation, that does not help to build functional relationships with the other, causing social discomfort and all sorts of prevarication.

Researching youth voices on Comprehensive Sex Education: a systematic review of qualitative studies
Keywords: Critical Thinking, Dialogic Pedagogy, Gender Issues, Meta-analysis
Presenting Author: Carolina Trivelli, University of Verona, Italy

The past decades have seen an increase in the design and implementation of sexuality education programs deemed ‘comprehensive’ within formal schooling. Such programs adopt a rights-based approach and are grounded in critical pedagogy, offering insights on positive sexualities, young people’s rights, participation and agency, and gender equality among others. Qualitative research is gaining relevance in the field; however, few studies focus on teenagers’ perspectives. This study analyzes qualitative research through a systematic review on the implementation of Comprehensive Sexuality Education (CSE) programs from the perspective of youth. A systematic review of qualitative studies with a subsequent meta summary were conducted to outline a ‘state-of-the-art’ of qualitative research on youth perceptions of CSE. Using specifically defined search terms, a database search was carried out of peer reviewed journals in five databases, arriving to a total of forty studies. Ten studies were included using supplementary searching. A total of fifty studies are included in the review.

The period of time ranges from January 1st, 2017, until July 31st, 2022 (post #metoo). Results point to two main areas of concern for young people: contents and pedagogical strategies. There remains a general dissatisfaction over depth and breadth of the CSE curriculum; most studies describe CSE as leaving them feeling unprepared for positive relationships and good sexual health. In terms of pedagogy, there is still a debt towards the adoption of experiential learning based on critical thinking.

Exploring gender differences in Coding at the beginning of Primary school
Keywords: Cognitive Skills and Processes, Computational Thinking, Gender Issues, Primary Education
Presenting Author: Costanza Padova, University of Padova, Italy, Italy; **Co-Author:**Chiara Montuori, Universita di Padova, Italy; **Co-Author:**Lucia Ronconi, Universita di Padova, Italy; **Co-Author:**Tullio Vardanega, Universita di Padova, Italy; **Co-Author:**Barbara Arfé, University of Padova, Italy

Coding, seen as a component of STEM and a tool for learning computing, has entered the curriculum of primary school education in several countries. Among the studies conducted to assess children’s coding skills and the effectiveness of instructional interventions focused on coding, few have examined gender-related differences in coding, especially in the early years (4-7) where gender-related stereotypes are not yet likely fully endorsed by children. Some of these studies report an advantage for boys in coding from their first experience with it. Previous research also found evidence of (1) association between the development of coding skills and children’s executive functions (EF); and of (2) gender differences in EF. In this work we explored the gender gap issue further, looking at whether gender differences emerged in the coding abilities of 1st graders, at their first experience with coding, and whether they were mediated by gender differences in EF, i.e., response inhibition and planning skills. We assessed the coding, response inhibition, and planning skills of 109 Italian first graders, before a coding course (*pretest*), when the children had no prior experience of coding. We repeated the assessment after the coding course (*posttest*). No statistically significant difference between girls and boys emerged at the pretest. Yet, an advantage in coding appeared for boys at the *posttest*. Mediation analyses show that the gender differences in coding were *not* mediated by children’s EF (response inhibition or planning).These results are part of a study in which we tested the effectiveness of coding.

Self-efficacy and utility value as predictors of adolescents’ intentions to study science subjects
Keywords: Gender Issues, Motivation, Science Education, Self-efficacy
Presenting Author: Erin Mackenzie, Western Sydney University, Australia; **Co-Author:**Kathryn Holmes, Western Sydney University, Australia; **Co-Author:**Nathan Berger, Western Sydney University, Australia

Expectancy value theory implies that adolescents’ subject selections will be motivated by their expectations for success in that subject, and the extent to which they value the subject. However, it is unknown whether these attitudes have distinctive roles in adolescents’ decisions to study different science subjects (biology, chemistry, and physics). In this study, we examined the relative contribution of gender, self-efficacy, intrinsic value, and utility value to adolescents’ intentions to study biology, chemistry, and physics in the senior years of high school. Participants were 475 adolescents (332 female, 141 male, 2 other) from five independent schools in Sydney, Australia. Data were collected using a survey that measured adolescents’ self-efficacy in biology, chemistry, and physics, intrinsic value of science, and utility value of science, along with their intentions to study biology, chemistry, and physics in the final two years of high school. Findings suggest that self-efficacy and utility value are the strongest predictors of adolescents’ intentions to study all sciences, and that gender is also influential in the cases of biology (favouring girls) and physics (favouring boys). On the other hand, intrinsic value did not predict adolescents’ intentions to study any of the sciences. These findings suggest that interventions to increase senior science enrolments should focus on building self-efficacy and increasing utility value of science.

Empowering e-learning relationships: refugee women explore civics during the lock-down in Greece
Keywords: Citizenship Education, E-learning/ Online Learning, Gender Issues, Migrant / Refugee and Minority students
Presenting Author: Agapi Chouzouraki, UNIVERSITY OF MACEDONIA, Greece; **Co-Author:**Ioanna Papavassiliou-Alexiou, University of Macedonia, Greece

Within a persistent and chronical gap of citizenship or social orientation state-run classes, refugees and asylum seekers in Greece face insurmountable difficulties towards their integration in general and in the labor market in particular. Especially for refugee and asylum seeking women, labor-market integration is more than often the only way towards emancipation, autonomy and self-esteem restoration. Therefore, innovative experiential learning program was designed for a group of refugee and asylum seeking women residing in Greece, aiming to explore the learners’ views on the role of democratic citizenship (EDC) and human rights education (HRE) in their career development, focusing on empowerment and career resilience. The training lasted an academic semester, was part of a PhD thesis and was at the premises of the University of Macedonia in Thessaloniki and then remotely, due to the measures taken in October 2020 to prevent the spread of corona virus. The latter condition of learning, greatly revealed opportunities for learning in a new environment which also created the space to cultivate and acquire other career-related skills such as flexibility, cooperativeness and tech-related ones. According to these vulnerable learners, the relationships shaped within this semester boosted their personal and professional empowerment and led to the enhancement of their resilience in the workplace.

Session U 20

26 August 2023 16:30 - 18:00
UOM_A10
ICT Demonstration
Learning and Instructional Technology

Supporting Multimodal Inquiry Science Learning with a Digital Notebook

Keywords: Educational Technologies, Inquiry Learning, Science Education, Simulation-based Learning
Interest group:

Please bring your own device if you are attending this ICT demonstration.
Students often struggle to engage meaningfully in science practices, and to write scientific explanations using evidence. Our ICT demo features a Digital Notebook created to support students' science learning and inquiry practices. The environment consists of multiple integrated tools to scaffold interactions such as, running a simulation; data generation, export, and analysis; and automatic assessment of students' written explanations using PyrEval (Gao et al., 2018), an NLP technology. The digital notebook also has a teacher dashboard which provides information about students' progress so teachers can make informed instructional decisions to better facilitate students' science learning and writing. The notebook has three views: student view, teacher view, and researcher view. We will discuss the backend architecture and various features of the tool and attendees will be able to try all three aspects of the notebook, while working to solve a design-based challenge and get automatic feedback on their essays, as students would. They will also learn how to create content and download data for analysis, from teacher and researcher perspectives.

Supporting Multimodal Inquiry Science Learning with a Digital Notebook
Presenting Author: Sadhana Puntambekar, University of Wisconsin, United States; **Co-Author:**Dana Gnesdilow, University of Wisconsin-Madison, United States; **Co-Author:**William Goss, University of Wisconsin-Madison, United States; **Co-Author:**Indrani Dey, University of Wisconsin-Madison, United States

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Session U 21

26 August 2023 16:30 - 18:00
AUTH_DC3
ICT Demonstration
Learning and Instructional Technology

nStudy: A software system for tracing learning

Keywords: Educational Technologies, Metacognition, Motivation, Self-regulated Learning and Behaviour
Interest group: SIG 16 - Metacognition and Self-Regulated Learning

Please bring your own device if you are attending this ICT demonstration.
Modern software technologies offer new opportunities to help researchers and learners examine learning. With learners' consent, software can track in fine-grained and extensive detail the information on which they operate; traces of cognitive, metacognitive and motivational operations they apply to information as they learn, and timing. This ICT demonstration displays how nStudy can help researchers overcome limitations of the conventional research paradigm to advance learning science. nStudy collects extensive trace data describing learning events in terms of information on which learners operate and the cognitive, metacognition, motivation and self-regulated learning operations they apply. Features of the software are demonstrated and data logged are displayed.

nStudy: A software system for tracing learning
Presenting Author: Philip Winne, Simon Fraser University, Canada

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