



# FLAIEC

FINNISH LEARNING ANALYTICS AND  
AI IN EDUCATION CONFERENCE

## PROGRAMME & ABSTRACTS

September 16<sup>th</sup>-17<sup>th</sup> 2024  
Joensuu, Finland



**Dear Colleagues,**

**I would like to warmly welcome you all to the second FLAIEC conference at University of Eastern Finland and to our Joensuu campus.**

It is our pleasure to host the FLAIEC 2024, the second Finnish Learning Analytics and Artificial Intelligence in Education Conference! The conference is arranged in Joensuu, Finland, on the 16th and 17th of September 2024. The conference is both on-site and online, and we have had the pleasure of receiving many interesting proposals for the conference. It is also a great privilege to welcome our prominent keynote speakers Professor Alyssa Wise, Professor Barbara Wasson and Associate professor Mohammed Saqr to the FLAIEC 2024. The keynotes bring topical themes to the conference with viewpoints to the actionability of learning analytics, and possibilities of implementation of learning analytics and AI in various contexts. Professor Wise will focus on how learning analytics and other data-powered technologies could integrate into or transform existing teaching and learning practices. Professor Wasson, in her keynote, will continue to investigate the complex challenges surrounding learning analytics implementation in education. Professor Mohammed Saqr's keynote will be presented in collaboration with European YUFE-network, and he will start on the challenges of LA and AI in attempts to generalize recommendations for learning, and he proposes the perspective of precision AI as a potential way forward.

The key focus of the FLAIEC conferences is on learning analytics and artificial intelligence to support teaching and learning in all contexts of education. The aim has been to bring together researchers from different countries and various disciplinary traditions to present their research in the field, to discuss the use of them to support learning, and the role of education and educational science in learning analytics and artificial intelligence. The conference is addressing both junior and senior scholars to present their work.

This year we have almost one hundred participants in this hybrid conference. The presentations cover a wide variety of perspectives on learning analytics and artificial intelligence in relation to teaching, learning and education. Papers are related to various levels of education and explore issues of self-regulated learning, social interaction, assessment and feedback as well as more generally pedagogical designs in relation to utilization of learning analytics and artificial intelligence.

FLAIEC 2024 is organized in collaboration with University of Eastern Finland, OAHOT research project and Learning in Digitalized Society (DIGS) research community. We would also like to thank Joensuu University Foundation and Federation of Finnish Learned Societies for participating in funding of the conference.

We wish you all a nice and fruitful FLAIEC 2024 conference in Joensuu and online!

**On behalf of the organizing committee,**

*Professor, vice dean Laura Hirsto (UEF), Chair of the FLAIEC 2024*



## GENERAL INFO

### VENUE

The conference takes place at **Aurora building** of University of Eastern Finland. (Yliopistokatu 2, entrance A) An adjacent space AU112 is available for working during the conference.

### LIVE & ONLINE SESSIONS

Presentations will take place in **AU111** and they will be streamed for online attendees. The **Zoom links** have been sent for registered attendees.

### DISCORD

We wanted to create a common platform to keep the conversation going. Therefore, join our Discord channel. We encourage active conversation during sessions and presentations, there you can also find the latest updates during the conference.

### REGISTRATION

The registration begins on Monday 16th September at 9:00 am in Aurora building. You will get your name badge from the registration desk. Please wear your name badge for identification during all conference events & lunches.

### LUNCH & COFFEE Monday & Tuesday

**Buffet lunch** will be served for the registered participants in the Aura restaurant, located at the Aurora building. A cup of coffee or tea is included with the lunch. Lunch coupons can be found in the conference bag.

**Coffee breaks** will take place in the corridor space, in front of AU111.

**Special dietary needs** indicated in the registration forms have been forwarded to the restaurants (Aura & Kimmel). Please contact the restaurant personnel if you have any questions about special diets.

### DINNER Monday night

The conference dinner is at Original Sokos Hotel Kimmel on Monday night at 19:15. (Itäranta 1, 80100 Joensuu; near the train station.)

### TIMEZONE

UTC +3

### MORE INFO

[sites.uef.fi/flaiee](https://sites.uef.fi/flaiee)



**If you have any urgent matters, please contact the conference secretaries Teija Paavilainen** (+358 50 3455625 | [teija.paavilainen@uef.fi](mailto:teija.paavilainen@uef.fi)) **or Jenni Bäckman** ([jenni.backman@uef.fi](mailto:jenni.backman@uef.fi))

## PROGRAMME

### Monday 16<sup>th</sup>

9:00–	Registration desk opens
09:45–10:00	<b>Opening of the Conference - Welcome to FLAIEC 2024</b> Vice Dean, Prof. <b>Taina Hintsa</b>
10:00–10:45	<b>Keynote 1: Professor Alyssa Wise</b> University of Vanderbilt, USA <i>Actionability, Agency and Equity in Learning Analytics and AI</i>
10:45–12:00	<b>Paper Session 1</b>
12:00–13:00	Lunch & coffee
13:00–15:00	<b>Paper Session 2</b>
15.00–15:30	Coffee
15:30–16:15	<b>Keynote 2: Professor Barbara Wasson</b> University of Bergen, Norway <i>Implementing Learning Analytics in Schools</i>
16:15–16:30	Break
16:30–18:00	<b>Paper Session 3</b>
19:15	Dinner at Original Sokos Hotel Kimmel (Itäranta 1, 80100 Joensuu)

### Tuesday 17<sup>th</sup>

9:00–10:50	<b>Paper Session 4</b>
10:50–11:00	Break
11:00–11:45	<b>Keynote 3: Associate Professor Mohammed Saqr</b> University of Eastern Finland, Finland <i>Precision Artificial Intelligence or why current AI won't save us</i>
11:45–12:45	Lunch & coffee
12:45–14:15	<b>Paper Session 5</b>
14:15–14:30	<b>Closing of the conference</b>
14:30–15:00	Coffee (to go)

## PAPER SESSIONS

### SESSION 1

Monday 16<sup>th</sup> | 10:45–12:00

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#### LA in various contexts

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Title	Author/s	
The use of Learning Analytics in teachers' practice in France - overview and analysis	Christine Schmider	Onsite
Creating process indicators from log data to analyse primary school students' multiple text comprehension	Norbert Erdmann Kasper Rautio	Onsite
Empowering Local Communities: A Servant Leadership Approach Utilizing Learning Analytics	Aisha Kairat Sonsoles López-Pernas Mohammed Saqr	Online
Building student engagement in higher education – longitudinal study of expectations and satisfaction on online-learning	Sari-Johanna Karhapää Helen Reijonen	Onsite
Learning Analytics to Support the Work of Guidance Professionals	Riina Kleimola	Onsite

**Chair: Vesa Paajanen**

## SESSION 2

Monday 16<sup>th</sup> | 13:00–15:00

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### Self-regulated learning and monitoring

Title	Author/s	
The differences in students' perceptions and the traceable usage of learning resources	Sami Heikkinen Pauliina Baltzar	Onsite
Applying learning analytics methods and multimodal data to study students' motivation, emotions, and socially shared regulation during collaborative learning	Tiina Törmänen Mohammed Saqr Sonsoles López-Pernas Hanna Järvenoja	Onsite
Applying longitudinal multichannel data to cluster online learners	Sami Heikkinen	Onsite
Digitally Enhanced Reflection to Support Primary School Pupils' Self-Regulated Learning	Teija Paavilainen Sonsoles López-Pernas Sanna Väisänen Sini Kontkanen Laura Hirsto	Onsite
AI-mediated collaborative learning: emerging interactional strategies and student experiences	Anni Silvola Joonas Merikko Anceli Kaveri Hanni Muukkonen	Onsite
Systematic literature review on automatic short answer grading through clustering	Li-Hsin Chang Xiaoshan Huang	Online
Differences of self-regulated learning between higher education students with and without a history of pedagogical support – a learning analytics approach	Kalle Venäläinen Erkko Sointu Sanna Väisänen Sonsoles López-Pernas Ville Tuominen Teemu Valtonen Mohammed Saqr Jyrki Virtanen Laura Hirsto	Onsite

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**Chair: Guy Trainin**

## SESSION 3

Monday 16<sup>th</sup> | 16:30–18:00

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### Generative AI in teaching and learning

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<b>Title</b>	<b>Author/s</b>	
Generative Dialogues: design iterations in professional development courses for faculty members to address the challenges of GAI in teaching	Lucía Gladkoff Elsa Beatriz Aubert Silvia Alejandra Andreoli Luciana Perillo María Cecilia Cherbavaz	Online
Collaborative learning partnership with Generative AI: Investigating the sequential interplay between knowledge co-construction and regulation with process mining	Faisal Channa Piia Näykki Päivi Häkkinen	Onsite
Generative AI as a tool for collaborative learning - do pre-service teachers engage in critical thinking when learning about sustainable development with AI?	Piia Näykki Auli Lehtinen Faisal Channa Emilia Ahlström	Onsite
Embracing the Future: An Investigation into Teacher Educators' Acceptance of Generative AI in Educators Preparation Programs	Guy Trainin Shuling Yang Azadeh Hassani	Onsite
Supporting children's creative writing skills with the help of generative artificial intelligence	Sini Kontkanen Vibeke Rønneberg Tiina Matveinen Ilkka Jormanainen	Onsite
Generative AI for Supporting Pre-Service Teachers' Collaborative Learning – Theoretical groundings.	Teemu Valtonen Jari Kukkonen Lasse Eronen Henri Heiskanen	Onsite

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**Chair: Janne Fagerlund**

## SESSION 4

Tuesday 17<sup>th</sup> | 09:00–10:50

### LA and AI in learning processes, feedback, and gamification

Title	Author/s	
LMS log activity and formative assessments – is the feedback itself enough to increase the motivation?	Vesa Paajanen	Onsite
Exploring Real-Time Feedback Seeking in an Online Learning Task - A Clustering Analysis	Chi Shing Lau Norbert Erdmann Mirjamaija Mikkilä-Erdmann	Onsite
Design of an Approach to Identify ADHD in Students within a Pedagogical Setting	Wissam Saleh Sabine Graf Sonsoles López-Pernas Erkko Sointu	Onsite
Virtual laboratories – just a videogame genre?	Ira Ekroth Vesa Paajanen	Online
Assessment of Accessibility in Virtual Laboratories: A Systematic Review	Fitsum Gizachew Mohammed Saqr Markku Tukiainen	Online
Somekone: The Social Media Machine	Nicolas Pope Anssi Lin Eetu Arkko Juho Kahila	Onsite
Optimizing Clinical Reasoning in Time-Critical Scenarios: A data-driven gamified multimodal approach	Sonsoles López-Pernas	Onsite

**Chair: Tiina Törmänen**



## SESSION 5

Tuesday 17<sup>th</sup> | 12:45–14:15

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### AI and LA in teaching and education

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<b>Title</b>	<b>Author/s</b>	
University teachers' ethical perceptions of AI and their self-efficacy for using AI in teaching	Sirkku Lähdesmäki Sanna Väisänen Heidi Hyytinen	Onsite
Exploring the development and impact of automated grading tools in education: strategies for AI-based assessment activities	Xiaoshan Huang Li-Hsin Chang Koen Veermaans	Online
Socially Accepted Boundaries For Using AI in Educational Contexts: Epistemic Network Analysis of Public Online Discussions	Joonas Merikko Anni Silvola	Onsite
AI and Higher Education Teachers: Expectations, Attitudes, and Ethics	Erkki Kaila Katja Lempinen Matias Nevaranta	Onsite
"There are many opportunities ahead, if we can just harness them all": Representations of Problems and Solutions in the Datafication of Education	Janne Fagerlund Lauri Palsa Pekka Mertala	Onsite
A Scoping Review of Idiographic Approach in Education Research	Hibiki Ito Sonsoles López-Pernas Mohammed Saqr	Onsite

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**Chair: Teemu Valtonen**

## KEYNOTE PRESENTATIONS

### KEYNOTE 1

Monday 16<sup>th</sup> | 10:00–10:45

**Professor Alyssa Wise**

University of Vanderbilt, USA

### **Actionability, Agency and Equity in Learning Analytics and AI**

To make a positive difference in education we must consider how learning analytics and other data-powered technologies are not only technically robust but also the ways they integrate into and transform existing teaching and learning practices. Taking a socio-technical systems perspective I first examine what it means for a learning analytics tool to be actionable and how we might incorporate richer attention to this construct into our design processes and studies of use. I then take a broader lens to examine how we might shift our thinking around what it means to develop learning analytics with equity mind, offering three critical reorientations: an emphasis on strengths and growth as well as gaps to be overcome; a repositioning of tools in service to learners' agency and solidarity; and the incorporation of a praxis of care. Central to both parts of the vision is an expansive role for participatory design practices that ensure that learning analytics initiatives are developed with and in response to the needs of the individuals and communities they are intended to support.

**Biography:** Dr. Alyssa Wise is Professor of Technology & Education and Director of LIVE, Vanderbilt's Learning Innovation Incubator. Dr. Wise's research combines the tools of data science, the theory of learning sciences and the practices of human-centered design to build and study the use learning analytics and artificial intelligence systems that promote equitable and effective education. Her recent efforts focus on developing alternatives to traditional dashboards that support data-informed decision-making and innovating novel asset-based generative AI applications. Dr. Wise holds a Ph.D. in Learning Sciences and M.S. in Instructional Systems Technology from Indiana University, as well as a B.S. in Chemistry from Yale University, and has previously worked with a wide range of non-profit organizations, educational technology start-ups, and classrooms across the Americas.

## KEYNOTE 2

Monday 16<sup>th</sup> | 15:30–16:15

### **Professor Barbara Wasson**

University of Bergen, Norway

## **Implementing Learning Analytics in Schools**

Research in the field of Learning Analytics and Knowledge has thrived over the past 12 years, yet its impact on education remains limited. Why is it so hard to implement learning analytics in education? This talk shares the efforts made by the Norwegian Ministry of Education's expert commission to address the technological, pedagogical, ethical, and legal aspects of the use of learning analytics and adaptive systems in the Norwegian educational sector. The commission's findings include four dilemmas associated with the use of these systems, as well as recommendations for the government regarding the use of pupil and student data for learning analytics and adaptive learning systems. Drawing upon my own research projects and my personal experience as part of the commission, this talk provides valuable insights into the complex challenges surrounding learning analytics implementation in education.

**Biography:** Professor Dr. Barbara Wasson is Director of the Centre for The Science of Learning and Technology (SLATE), the Norwegian national centre for learning analytics. She was one of the founders of Kaleidoscope, a European Network of Excellence on Technology Enhanced Learning. Wasson is/has been PI for numerous national and international projects, including the Erasmus+ project DALI: Data Literacy for Citizens. She was a member of the Norwegian Ministry of Education's Expert commission on Learning Analytics, and is currently a member the Council of Europe Expert Group on AI in Education and the sub-group on Policy in Higher Education. She is also Norway's representative to the European School Net's Data Interest Group. Her research interests include learning analytics, AI and education, learning games, teacher inquiry, and data literacy.

## KEYNOTE 3

Tuesday 17<sup>th</sup> | 11:00–11:45

### **Associate Professor Mohammed Saqr**

University of Eastern Finland, Finland

## **Precision Artificial Intelligence or why current AI won't save us**

Current implementations of AI use aggregate data from many others to derive generalizable laws, and recommendations. The training data of these models reflects the average, the WEIRD or simply, the available. In doing so, it amplifies all the imperfections and shortcomings of our available world. Furthermore, such models paint the average as a “norm” and deviations as noise rather than natural manifestations of individual differences. Given that we are all different, have our peculiarities and unique characteristics, the average is rare and possibly non-existent. Therefore, recommendations using such models are likely to be useless for many, harmful for some and maybe –if at all– useful for some.

This keynote will explain why current AI implementations may be useful for some purposes, help accelerate some tasks or improve others but won't solve our most pressing problems: how to personalize education, offer support when it is needed and how it should be. On the contrary, precision AI created using individualized models holds the promise for moving us forward. The keynote will demonstrate several examples of precision AI.

**Biography:** Mohammed Saqr is an Associate Professor of Computer Science at the University of Eastern Finland and holds the title of Docent in Learning Analytics from the University of Oulu. His research interests span learning analytics, AI, big data, network science, and the science of science and medicine. He has received multiple awards, including best paper award at LAK, ICCE, TEEM, CITE, and for his doctoral thesis. In 2023, the Society of Learning Analytics Research (SOLAR) recognized his contributions with the Europe Emerging Scholar Award. Mohammed has secured funding from the Academy of Finland, Swedish Research Council, and the European Commission. He serves on the editorial boards of several journals, including Transactions of Learning Technologies, the British Journal of Education Technologies, and PLOS ONE. His collaborative network extends to researchers in Finland, Spain, Sweden, Germany, Serbia, Australia, France, Switzerland, the UK, the USA, and the Netherlands.

## **ABSTRACTS**

Abstracts are in the presentation order.

### **SESSION 1**

#### **The use of Learning Analytics in teachers' practice in France - overview and analysis**

**Christine Schmider**

Université Côte d'Azur, France

The aim of my presentation is to provide an overview of the use of learning analytics in the French education and training system. In a country where the notion of differentiated teaching is paramount and where all teachers have been using a national digital school life management platform (Pronote) providing class attendance data and data for personalised student support since 1999, the use of learning analytics is inevitably at the heart of the educational science research and debate. But what about concrete uses in the teaching community? Do teachers' practices in learning data analysis reflect the importance of scientific debate? What use do they make of the tools available to them? To answer these research questions, I will present the results of a study on the use of LA for school purposes and the tools used in the French context, commissioned by the French Ministry of Education. The study is part of a report drawn up by the Digital Thematic Group No. 2 (GTnum2), "Learning Analytics", on the initiative of the French Department of Digital Education (DNE-MENJ) in 2020. It consisted of a preliminary survey targeting around thirty teachers and an exploration of some of the tools they use from a learning analytics perspective. In my presentation, I will focus on the results of 5 areas covered in the questionnaire: 1. Teachers' digital practices 2. Teaching practices for understanding and monitoring student activity 3. Barriers, obstacles or difficulties encountered in understanding and monitoring student activity. 4. Teachers' perception of the contribution of LA to understanding and tracking students' activity. 5. Teachers' perception of the limits of the use and the reliability of traces provided by LA. The analysis of the study results will provide an answer to my research questions and outline suggestions for French educational stakeholders.

#### **Creating process indicators from log data to analyse primary school students' multiple text comprehension**

**Norbert Erdmann & Kasper Rautio**

University of Turku, Finland

In current world learning often takes place within the Internet even in primary education (Florit et al. 2020; Mason 2018). The aim of this study is to create indicators from log data for investigating the complex process of multiple text comprehension. Multiple text

comprehension consists of the following phases: reading the assignment, searching for relevant pages, reading the pages, organising the relevant text segments and writing synthesis based on multiple texts. A closed www environment where students practice all multiple text comprehension skills was designed for this study. A software application was also created to collect log data in this project. Some basic process indicators like time on task and frequencies concerning how often the phases were visited (Greiff et al. 2016) were used to make students' multiple text comprehension process visible. The preliminary results indicate that primary school students' processes vary a lot and they used versatile ways to perform the task.

## **Empowering Local Communities: A Servant Leadership Approach Utilizing Learning Analytics**

**Aisha Kairat, Sonsoles López-Pernas & Mohammed Saqr**

University of Eastern Finland, Finland

Community education is an empowering model that provides education to remote, underprivileged villages and hamlets where children have no access to mainstream education. The Community Education (CE) model is based on the philosophy of transforming individuals to reach their full potential and on instilling the seeds of empowerment and citizenship to induce societal transformation.

This research aims at investigating the perception of school facilitators (teachers) of their leadership and to which degree it empowers them. Using learning analytics, this research utilizes person-centered approaches to provide the body of knowledge with findings that capture unique human differences across participants. In such vulnerable communities, addressing individual differences and refraining from generalizations is necessary for the development of culturally responsive and contextually appropriate interventions that are tailored to the specific needs, values, and cultural norms of the community.

A validated and tested multi-dimensional Servant Leadership Survey was conducted to capture the perceptions of empowerment in the views of a sample of 280 community school facilitators (teachers) spanning six Egyptian governorates. The survey measured servant leadership manifested into eight factors: empowerment, humility, courage, accountability, stewardship, authenticity, forgiveness, and standing back. Refraining from the reductionist perspective on human behavior, adopting the understanding that learning is intricate aligns better with reality and offers the prospect of reconstructing our knowledge to better suit the realities of the communities we are aiming to support. Latent profile analysis and psychological network analysis were utilized to capture such personalized perceptions of empowerment.

Using latent profile analysis, which is a person-centered approach, the findings reveal four clusters: the Visionary, the Empowering, the Enterprising, and the Compassionate. Psychological network analysis also provides means to address the nonlinearity and

complexities of human perceptions and account for interactions, interdependencies, and heterogeneity. By plotting the between-person network for our sample, findings reveal strong correlations between empowerment, stewardship, and humility. The variable that has the potential for intervention is forgiveness.

The existing body of literature lacks research examining the application of learning analytics in examining empowerment within vulnerable community education contexts. Moreover, there is a notable absence of studies exploring the intersection between empowering leadership theories, namely servant leadership, and the perceptions of leadership within these communities. This represents a significant gap in understanding the potential impact of utilizing learning analytics and servant leadership empowering approach in the development of such contexts. Addressing this gap is essential for developing a more comprehensive understanding of effective educational practices and leadership strategies tailored to the needs of such vulnerable communities.

## **Building student engagement in higher education – longitudinal study of expectations and satisfaction on online-learning**

**Sari-Johanna Karhapää & Helen Reijonen**

University of Eastern Finland, Finland

Students' first year experiences and perceptions are critical in engaging students in higher education. The present study explores how the students' expectations were met and how satisfied student perceived to be with the university in the context of disruption in learning environment. The qualitative empirical study is based on a data collected in two phases in a multidisciplinary medium-sized research university in Finland. At the first phase, a survey was conducted at the spring term in 2019 of the first-year students who had started their studies in the autumn 2018. At the second phase, a follow-up survey was conducted to the same student group in the autumn term in 2021 when the COVID-19 lock-down had forced a major shift to online learning. The preliminary analysis of the students' expectations and satisfaction shows multifaceted perceptions and experiences of online learning. On one hand, the students seemed mainly to be satisfied with the possibilities of online learning and to have positive experiences of it both before and after the pandemic, although also challenges and dislikes were reported. On the other hand, students expected contact learning in a classroom to reinforce their professional identity and skills, and to bring them closer to other students and teachers.

# Learning Analytics to Support the Work of Guidance Professionals

**Riina Kleimola**

Centria University of Applied Sciences, Finland

Learning analytics provides higher education institutions with a novel means to advance student development and growth towards expertise (Author et al. 2023, 2024; Schumacher & Ifenthaler 2018). In recent years, there has been a particular interest in the use of learning analytics dashboards to improve teaching and learning and to help students to achieve their educational goals (Park & Jo 2015; Susnjak et al. 2022). According to research, such analytics tools have also appeared promising in the context of guidance to facilitate educational decision making (Gutiérrez et al. 2020), to support active dialogue between guidance professionals and students (Charleer et al. 2017; De Laet et al. 2020), and to promote student's self-regulated learning processes (Author et al. 2024). However, in order for learning analytics dashboards to be a functional part of the comprehensive guidance and student support, their use should be connected into organization-level processes and established practices (Author et al. 2024; Guerra 2020; Wise et al. 2016). Without the close connection of learning analytics to educational practices, its potential as a support tool remains limited (Author et al. 2024).

Centria University of Applied Sciences has recently launched an organization-wide project that aims to make a systematic use of learning analytics as a new type of learning support. One of the key project objectives is to encourage guidance professionals, such as student counsellors and teacher tutors, to take advantage of a learning analytics dashboard in their work and to promote the monitoring of students' study progress—both at an individual and a group level. By making use of analytics data, the guidance professionals have better opportunities to design and implement student support and guidance that effectively meet the needs of a particular student or a student group.

During the project, the guidance professionals are introduced with practical case examples on how to use the learning analytics dashboard as a part of educational processes and how to integrate its use into relevant pedagogical practices and learning theories. The learning analytics dashboard will gradually become available to the guidance professionals in all degree programs. It is currently in the technical testing phase and will be piloted with a group of guidance professionals in the academic year 2024–2025.

As a part of the project, the purpose is to conduct a qualitative study that aims to increase understanding on the perspectives of guidance professionals on the use of the learning analytics dashboard as a part of guidance work. Furthermore, the aim is to better identify the possibilities and limitations of the learning analytics dashboard as student support. A preliminary research question is: What kind of aspects are considered to promote and prevent the use of a learning analytics dashboard in the context of guidance? The target group of the study consists of guidance professionals participating in the project and piloting. More detailed stages of the study will be specified, and preliminary results will be reported as the project progresses.



Large-scale deployment of learning analytics is still in its initial phases in many higher education institutions (Clark et al. 2020), and the evidence on its successful implementation is scarce (Ferguson et al. 2016). Therefore, it is increasingly important to involve different user groups in its active use and exploration. Understanding the possibilities and limitations of learning analytics in guidance also provides the foundation for more effective learning support.

## SESSION 2

### The differences in students' perceptions and the traceable usage of learning resources

**Sami Heikkinen<sup>1</sup> & Pauliina Baltzar<sup>2</sup>**

<sup>1</sup> LAB University of Applied Sciences, Finland

<sup>2</sup> Tampere University, Finland

As online teaching and learning gain more traction, accessibility is becoming increasingly crucial. Learning analytics can be effectively employed to evaluate the accessibility of online courses and track how learners utilize the available resources. With its practical implications, this research delves into how learners use various learning resources and compares their preferences with trace data to assess whether students are using their preferred materials. The study also examines potential differences in learning resource usage among students from different disciplines and age groups. The survey data (n=123) is gathered from two Finnish higher education institutions on two courses. Ultimately, the findings underscore the need for a nuanced approach, as students do not always adhere to their preferences, and there are some variances in learning resource usage among certain disciplines and age groups. Future research on the connection between accessibility and learning analytics should expand the data, including the learning outcomes to variables, and examine the longitudinal nature of accessible learning resource usage.

### Applying learning analytics methods and multimodal data to study students' motivation, emotions, and socially shared regulation during collaborative learning

**<sup>1</sup>Tiina Törmänen, <sup>2</sup>Mohammed Saqr, <sup>2</sup>Sonsoles López-Pernas & <sup>1</sup>Hanna Järvenoja**

<sup>1</sup> University of Oulu, Finland

<sup>2</sup> University of Eastern Finland, Finland

Collaborative learning research is increasingly recognising the need to gain better understanding of the learners' intertwined cognitive, motivational, and emotional processes that influence various learning outcomes. The availability of multimodal process data with varying granularity is providing opportunities for researchers in this area. However, effective and meaningful analysis of the complex data sets to reach integrated interpretations poses a significant challenge. In this presentation, we will showcase our ongoing efforts in analysing multimodal learning process data using advanced learning analytics methods. Our objective is to understand the role of secondary school students' motivation, emotions, and socially shared regulation (SSRL) in the context of collaborative learning.

The participants of the example studies were 95 secondary school students, who performed a collaborative science task in small groups (N=31) of 2-4. The groups' collaborative

learning was videorecorded to capture their cognitive and socio-emotional interactions, including SSRL. The students' motivational appraisals of the learning situations were collected with a repeated situational self-report and stimulated recall interview. Moreover, the students' physiological arousal during the task was detected with electrodermal activity (EDA) to indicate their emotional activation.

In the first example study, the aim was to understand how SSRL, specifically monitoring and controlling activities, and students' expectancies for success as a motivational appraisal are interrelated in collaborative learning. The multimodal data set was analysed with multichannel sequence mining and clustering using mixture hidden Markov models to identify two different types of SSRL sequences (engaged in SSRL and occasional cognitive SSRL). The sequences were further related to the students' expectancies for success during and after the task. The second example study aimed to investigate emotional dynamics and emotion regulation in collaborative groups. Video data was used to observe the valence of students' emotional reactions, employed emotion regulation strategies, and the related stimulus events, whereas EDA was utilized to detect students' emotional activation. Utilizing temporal network analysis, the study demonstrated the temporally unfolding connections between stimulus events, students' emotional reactions, and actualized emotion regulation strategies.

The two examples showcase our approach in utilizing learning analytics methods when aiming towards a more comprehensive understanding of SSRL in collaborative learning by implementing multimodal data analysis. The combinations of strong theoretical understanding with sophisticated and appropriate analytical means deriving from learning analytics enable theoretically grounded and empirically meaningful interpretations of the complex data sets. In the presentation, the opportunities and challenges related to multimodal data will be further discussed from the theoretical, empirical, and methodological points of view.

## **Applying longitudinal multichannel data to cluster online learners**

**Sami Heikkinen**

LAB University of Applied Sciences / University of Eastern Finland, Finland

The digital revolution has ushered in a new era of education, characterized by the proliferation of online learning platforms. These platforms, while offering flexibility and convenience, also present unique challenges due to their temporal span, often extending over a significant duration. This necessitates a comprehensive and continuous evaluation of the learning processes, which can be facilitated through the analysis of longitudinal data. Our ongoing research is centered around the integration of survey data and online trace data to elucidate the longitudinal trajectory of learning. The survey data provides valuable insights into learners' perceptions of their self-regulated learning, captured at multiple timepoints during an online course. This subjective data is complemented by the objective trace data, which records the actions undertaken by learners during their online study sessions. The amalgamation of these

diverse data sources results in a multi-channel dataset, which is subsequently subjected to a rigorous longitudinal analysis. This method allows us to identify patterns and trends in the learning process over time, thereby enabling a more nuanced understanding of online learning dynamics. One of the key outcomes of this analysis is the formation of student clusters, which serve as representative learner profiles for an online course. These profiles, characterized by distinct learning behaviors and trajectories, can be instrumental in the design and implementation of targeted interventions. Such interventions, tailored to the specific needs and challenges of different learner profiles, can provide timely and effective support to learners, thereby enhancing their online learning experience and outcomes. In conclusion, our research underscores the potential of integrating survey data and online trace data to trace the longitudinal nature of learning in online courses. It also highlights the value of learner profiles in informing the development of personalized interventions, ultimately contributing to the optimization of online learning environments.

## **Digitally Enhanced Reflection to Support Primary School Pupils' Self-Regulated Learning**

**Teija Paavilainen, Sonsoles López-Pernas, Sanna Väisänen, Sini Kontkanen & Laura Hirsto**

University of Eastern Finland, Finland

Self-regulated learning (SRL) should be regarded as an important learning object already in primary school. The ability to metacognitively reflect on one's learning is an important aspect of SRL. This study explores primary school pupils' (5th and 6th year) reflection in different phases of an SRL process during a study module where reflection was prompted through the learning management system as question prompts and learning analytics visualisations. Pupils' written answers to reflection prompts were first analysed using a qualitative content analysis. Three specific reflection profiles were identified using a latent class analysis: Reluctant, Nascent and Active reflectors. Differences between the profiles were found in the goal-setting and monitoring phases. The associations between the profiles and study grades were analysed using a Chi-square test. Pupils with the lowest grades were more likely to belong to the Reluctant reflectors profile.

## AI-mediated collaborative learning: emerging interactional strategies and student experiences

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Recent advancement of generative artificial intelligence (AI) technologies have created novel opportunities for supporting learners. Use of conversational agents (CAs), such as chatbots, has spread rapidly in different contexts of learning. There is an urgent need to understand what kind of capabilities are needed from students to utilize AI as a resource for learning productively, and what kind of ethical boundaries direct AI use. This study focuses on large language model (LLM)-based conversational agents (CAs) that have a targeted objective in their functions and that use natural language to interact with their users (McTear et al., 2016). This study investigates use of CAs in collaborative learning situations. The focus is to analyze what kind of interactional patterns emerge in collaborative learning situations with student small-groups and CAs, and how students perceive the boundaries of using CAs as a learning resource in different kinds of challenge situations. This study approaches CA use as a sociotechnical ensemble, where socially constructed boundaries determine how digital technologies should work (Bearman & Ajjawai, 2024). AI interaction takes place in the context of a specific interaction, such as discussion with CA, when a computational artifact provides a judgment to inform an optimal course of action and that this judgment cannot be traced back to the logic of the artifact (Bearman & Ajjawi, 2024). In this study, student-AI interactions are empirically investigated in collaborative settings. In these settings, students work in small-groups to resolve different types of challenge situations and are advised to consult CA in different phases of their work. The problem scenarios are used to simulate cognitive, metacognitive and socio-emotional challenges. Collaborative settings are used as a window to gain a rich understanding both about students' thinking about the CAs and the actions they collaboratively take to employ the AI agent strategically as a resource for their learning (Moya & Damsa, 2023; Enyedy & Stevens, 2022). Furthermore, collaborative settings enable analyzing the role of AI tools as new kinds of technological agents directing and supporting students' collaborative work. Based on Silvola et al. (2023) who suggest that individuals' interactions with technology are shaped by their underlying assumptions, knowledge, and expectations, we hypothesize that the patterns that students apply when working with AI and their responses for AI inputs differ based on their conceptions of AI. We set following research questions: 1) What kind of interactional patterns can be found when students work with AI in cognitive, metacognitive, and socioemotional challenge situations? 2) How do students describe their conceptions of AI? 3) How do students reason their willingness to utilize AI as a resource for learning in different contexts?

Questionnaire, video, and stimulated recall -interview data will be collected to empirically investigate students' interactional patterns with CAs. Qualitative analysis methods and learning analytics methods, such as epistemic network analysis, will be used to analyze

students' interactional patterns and sociocultural boundaries that direct AI use across different challenge scenarios. Preliminary findings from the pilot data collection (N=28) indicate that students typically perceive AI agent as a useful source of support in facing cognitive challenges, such as problems in mathematics, but they are more critical towards support received for socioemotional challenges, such as loneliness and insomnia. Furthermore, students typically consider ethical issues of AI as important but their conceptions of AI and its use vary. Ethical board of University of Oulu is being consulted about the research design of the study.

## **Systematic literature review on automatic short answer grading through clustering**

**Li-Hsin Chang & Xiaoshan Huang**

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Background: Open-ended questions promote higher level thinking skills in the Bloom's taxonomy compared with question types such as multiple choice questions. The grading of open-ended questions are more tedious, and numerous studies have investigated its automation. Automatic short answer scoring (ASAG) is a natural language processing task that aims to reduce human grading effort of short answers by leveraging computational methods. One research direction of ASAG involves clustering of answers, often for bulk grading of similar answers by teachers. Such studies aim to aid grading by reducing the manual effort required, without relying on machine to assign grades. While many studies have been published in this direction, they are relatively isolated from one another, except for a few more well-known papers. We aim to provide insights into the current state of clustering for ASAG, encompassing its utilization, tested algorithms, utilized data, evaluation methods, and study outcomes.

Research questions: 1. How are clustering algorithms used in ASAG? 2. What clustering algorithms are used in ASAG? 3. What datasets are the available datasets for clustering for ASAG? 4. What evaluation metrics have been used for clustering for ASAG? 5. What are the outcomes of studies on clustering for ASAG?

Results: 549 publications collected from the following databases are included for initial screening: Semantic Scholar, Google Scholar, ACM Digital Library, IEEE Xplore, and arXiv. 47 publications fulfill the screening criteria and are included for analysis: 1. While clustering can be used for grouping together graded answers to extract scoring rubrics, or some scored answers can be clustered with unscored ones for score propagation, the majority of studies cluster unscored answers for bulk grading by teachers. 2. Most studies use common clustering algorithms such as k-means, affinity propagation, and agglomerative clustering. Some focuses on algorithms tailored to specific goals, such as hierarchical and evolutionary clustering. 3. The Powergrading dataset is the most popular dataset for clustering for ASAG. However, the majority of studies use private datasets of various sizes, educational levels, and languages. 4. There is no standard metrics for clustering for ASAG, and the metrics used depends on the

goals of the individual studies. While some studies use clustering metrics such as Rand index, normalized mutual information, and cluster purity, or ASAG metrics such as quadratic weighted kappa, many studies use self-devised metrics based on manual grading time or manual effort saved. 5. The included studies generally report neutral to positive results in terms of experimental numbers, but most of these results have not been translated to actual usage. Individual studies have shed light on potential obstacles, such as teacher grading habits.

Conclusions: This study overviews the use of clustering in ASAG in terms of clustering usage, algorithm, dataset, evaluation metric, and results. Challenges lie in translating research findings into practical use, which requires high performance and teacher acceptance. Future work lies in the incorporation of the essence of this research line with the use of large generative language models, as well as ethical considerations surrounding the use of computer-aided grading systems.

## **Differences of self-regulated learning between higher education students with and without a history of pedagogical support – a learning analytics approach**

**Kalle Venäläinen, Erkki Sointu, Sanna Väisänen, Sonsoles López-Pernas, Ville Tuominen, Teemu Valtonen, Mohammed Saqr, Jyrki Virtanen & Laura Hirsto**  
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Despite the growing awareness of students' needs for learning support in higher education, research in this area is still lacking. Here, we investigated the self-regulated learning of students in Finnish higher education – those with and without a history of pedagogical support from their previous school levels – in flipped courses using both dispositional learning analytics and learning analytics data. Specifically, self-regulated learning was investigated before and after course participation across the entire sample (N=217), and possible differences were compared within a limited subset of participants (N=108). We found that self-regulation of process and results, lack of regulation and shared regulation increased, while task avoidance decreased, for all students between two measurement points. When comparing the groups using dispositional learning analytics, students with a history of pedagogical support (N=38) had more positive experiences with the learning management system than the group without a history of pedagogical support (N=179). Interestingly, more differences between groups with and without a history of pedagogical support were found using learning analytics data.

## SESSION 3

### **Generative Dialogues: design iterations in professional development courses for faculty members to address the challenges of GAI in teaching**

**Lucía Gladkoff, Elsa Beatriz Aubert, Silvia Alejandra Andreoli, Luciana Perillo & María Cecilia Cherbavaz**

Universidad de Buenos Aires, Argentina

This study examines the design process and implementation outcomes of two professional development courses for faculty members, following a multidimensional approach and addressing teaching strategies and assessment of learning. The proliferation of Generative Artificial Intelligence agents, like ChatGPT, has raised numerous questions and reflections within the educational community that require deep and critical considerations of technology and pedagogy, taking into account cultural, ethical, epistemological, and didactic challenges. The methodological approach adopted is educational design-based research, emphasizing the comprehensiveness of the design process, implementation, and evaluation. Mixed strategies were used for the study, including document analysis, pilot testing, and prototyping, within a framework situated in the actual educational context. Close collaboration among researchers was deemed essential to strengthen the validity and robustness of the results. This study contributes to the understanding of the design process of innovative training proposals. The findings highlight the need for a flexible and reflective approach to address emerging educational challenges in a context of accelerating digital.

### **Collaborative learning partnership with Generative AI: Investigating the sequential interplay between knowledge co-construction and regulation with process mining**

**Faisal Channa, Piia Näykki & Päivi Häkkinen**

University of Jyväskylä, Finland

Research has shown that socially shared regulation of learning (SSRL) supports knowledge construction (KC) and helps learners attain their collaborative learning goals. KC has widely been described as an interactive collaborative process in which learners socially co-construct knowledge and extend individual learning through shared knowledge in collaboration by sharing, comparing, and negotiating prior knowledge. According to Gunawardena et al.'s (1997) Interactional Analysis Model (IAM), knowledge construction interactions have five major phases related to different stages of the collaborative learning process. During phase 1, learners begin co-constructing knowledge by sharing and comparing previous knowledge, ideas, and opinions. In Phase 2, they face cognitive dissonance, demonstrating disagreement regarding their perceptions or understanding. Next, they negotiate to develop a shared understanding –



reaching to intersubjectivity – to co-construct knowledge during Phase 3. The IAM model entails phase 4 of knowledge co-construction when learners test and modify co-constructed knowledge and solutions, and phase 5 when group members confirm their agreement and apply newly co-constructed knowledge and solutions. Studies have shown that collaborative learning can pose different types of challenges (i.e., socio-cognitive, socio-emotional, and motivational) for collaborative groups. To resolve these challenges and attain shared learning objectives, research emphasizes that learners need to apply SSRL (i.e., deliberate planning, monitoring, and controlling of the learning process in terms of cognition, emotion, and motivation at individual and group levels). Studies emphasize that distinguishing and understanding the interplay between KC and SSRL is essential for supporting collaborative learning processes. Therefore, this study aims to investigate how phases of KC and SSRL strategies interplay during collaborative learning partnerships using generative AI (i.e., ChatGPT) as a learning tool. Twenty-four in-service teachers, in groups of three, were video observed while collaborating with ChatGPT to develop a lesson plan on “Education for Sustainable Development” on a desktop computer in a face-to-face situation. In the analysis, video data were coded at a fine-grained level for cognitive challenges, KC phases, and SSRL, namely planning, monitoring, and controlling, using a theoretically driven coding scheme. The coded data was analyzed by using learning analytics with process mining techniques in R statistical programming to visualize the sequential patterns of the phenomena as process maps. Results revealed that the groups demonstrated stronger sequential patterns between cognitive challenges and planning and controlling than monitoring. The groups manifested stronger sequential patterns between cognitive challenges and KC phase 3 (i.e., negotiate/co-construct) than other phases. In terms of sequential interplay within KC phases, the groups frequently developed stronger patterns between phases 3 and 4 than other phases of KC. The study has practical implications for collaborative learning with generative AI, learning analytics, teacher education, and theoretical and methodological implications for research on regulated learning. Suggestions for developing collaborative pedagogy, tailoring support for collaborative tools, designing learning analytics tools, and developing pedagogical methods can be used to support KC and encourage learners to initiate regulation to encounter challenges.

## **Generative AI as a tool for collaborative learning - do pre-service teachers engage in critical thinking when learning about sustainable development with AI?**

**Piia Näykki, Auli Lehtinen, Faisal Channa & Emilia Ahlström**

University of Jyväskylä, Finland

The aim of this study is to explore if and how students in collaborative learning groups engage in critical and reflective thinking while using generative AI tools. Data were collected in a pre-service teacher education course (N = 45 students, working in 15 groups of 2-4 members).

Groups were given the task of developing a lesson plan on primary education for sustainable development. The groups were instructed to use generative AI tools and other relevant materials from the internet or other available sources. The groups worked on a desktop computer in a face-to-face situation. Video observation data was collected using both external cameras and screen recording. In this ongoing analysis, we will focus on the ways in which students negotiate and produce a written prompt for AI (based on the interaction of group members in the video data and the actual written prompt). We will also explore how students respond to and use the information generated by the AI. In the first phase of the analysis, we have identified the number and type of prompts that students made to the AI. In subsequent phases of analysis, we will explore the quality of the prompts and the ways in which students evaluated and used the AI-generated information provided in their group task. This study can be used as an empirical example of how first year pre-service teachers spontaneously engage in critical and reflective evaluation of the AI-generated information when working in small groups. When the study is completed, we may be able to provide information on how to guide students individually and in groups to reflect on their conceptual and pedagogical understanding of the topics when learning with generative AI tools.

## **Embracing the Future: An Investigation into Teacher Educators' Acceptance of Generative AI in Educators Preparation Programs**

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This study explored teacher educators' acceptance and perceptions of using General Artificial Intelligence (Gen AI) in their practices, particularly with preservice teachers. Guided by the Technology Acceptance Model Plus Plus (TAM++), this study utilized a comprehensive survey methodology to investigate perceived usefulness (PU), perceived ease of use (PEU), attitudes toward using Gen AI, and GEN AI frequency of use. Emerging literature underscores the necessity of integrating Gen AI into teacher education, highlighted by reflections from the National Technology Leadership Summit (NTLS). The study used an 18-item survey that included a Likert scale and open-ended questions. Preliminary findings indicate excellent reliability and validity for the TAM++ instrument. Fifty-three teacher educators from across the US responded to the survey. Results showed that teacher educators perceived the usefulness of GEN AI significantly higher than the perceived usefulness of their preservice teachers. At the same time, there was no difference in the ease of use factor. We calculated a difference in the score between GEN AI orientation and GEN AI concern, which revealed a bimodal distribution, with 30.02% of teachers showing more concern than positive orientation. Finally, a stepwise regression predicting the frequency of GEN AI use showed only one predictor AI Orientation was significant  $F(2, 52)=46.80$   $p<.001$   $R^2=.479$ . As Gen AI continues to evolve, it is imperative that educational stakeholders critically assess and address the concerns of teacher educators to foster an environment that supports effective and beneficial integration of AI technologies. Ensuring that teacher educators are well-informed and consider ethical and pragmatic

elements of Gen AI will be crucial in maximizing its potential benefits in teacher education. Future research should continue to explore these dynamics as Gen AI becomes increasingly embedded in educational contexts, with a focus on developing strategies to enhance acceptance and optimize instructional outcomes.

## **Supporting children's creative writing skills with the help of generative artificial intelligence**

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This study aims to enhance creative writing skills in 6–8-year-old children using generative artificial intelligence (GAI). While research on writing skills has primarily focused on spelling and linguistic features, there's a gap in understanding the creative aspects of writing. The study collaborates with GAI experts, teachers, and pupils to develop safe ways for GAI to support creative writing. Three objectives guide the study: understanding teachers' knowledge and expectations of GAI, creating a safe GAI application, and developing pedagogically sound ways to use GAI in classrooms. The study employs both qualitative and quantitative research methods, including interviews, observations, and questionnaires. The findings will contribute to literacy skill research and advance the field of educational GAI.

## **Generative AI for Supporting Pre-Service Teachers' Collaborative Learning – Theoretical groundings**

**Teemu Valtonen, Jari Kukkonen, Lasse Eronen & Henri Heiskanen**

University of Eastern Finland, Finland

This work in progress paper outlines assumptions and expectations about the possibilities of artificial intelligence (AI) for supporting learning. We highlight topics that should be taken into account when considering the use of AI, especially large language models such as ChatGPT and Copilot, for supporting collaborative learning practices. The utilization of these technologies requires elevating the pedagogical questions to the central role. We assume that with an appropriate pedagogical design, these applications can serve as valuable tools to foster and stimulate students' cognitive engagement and collaborative knowledge creation, instead of substituting these important elements of the learning process. Especially, the research conducted within the field of collaborative learning, offers valuable perspectives to be considered as the starting points for utilizing AI. Within this paper we outline some of these key themes. This work in progress paper offers pedagogical perspectives for the utilization of artificial intelligence as well as an example of an upcoming research pilot.

## SESSION 4

### **LMS log activity and formative assessments – is the feedback itself enough to increase the motivation?**

**Vesa Paajanen**

University of Eastern Finland, Finland

Formative assessments are clearly beneficial for the students as they can have more authority on the learning goals and studying times than on courses with examination. Furthermore, students will receive feedback and guidance for their formative assessments which can help them to achieve the required learning outcomes. Therefore, the formative assessments are plausible method for the evaluation during flipped classroom courses in which autonomous studying activity is in the center of the learning process. However, as assessments without direct control have recently faced critics in higher education, the course activity of students needs to be studied in a course turned from summative to formative assessments. Exams in an undergraduate flipped classroom bioscience course were replaced with formative assessments in fall 2019 and the course activity and learning outcomes of 352 voluntary students were collected for this study during the academic year 2019-2020. Shift from summative to formative assessments increased the proportion of high-grade students significantly in a permanent manner. This was related to students' increased activity in LMS but not directly to the essay feedback. The LMS activity of all student groups had a fade out during the 3-month course and participation into the social elements of the course was significantly increasing the students' motivation to persevere their study work and reach their learning goals. In contrasts, students with low course activity in the beginning of the course, were in a substantial risk of dropout and in many cases ended their study work before submitting a single formative assessment into which they could get teacher's feedback and guidance. Therefore, the formative assessments are an effective way to potentiate learners' self-regulation on the workload and the learning goals, but it requires students' motivation to study.

### **Exploring Real-Time Feedback Seeking in an Online Learning Task - A Clustering Analysis**

**Chi Shing Lau, Norbert Erdmann & Mirjamaija Mikkilä-Erdmann**

University of Turku, Finland

This quasi-experimental study investigated how students engage with feedback seeking within an online learning environment. Four distinct student profiles emerged based on their feedback-seeking tendencies: Disengaged Learners, Paradoxical Independents, Proactive Feedbackers, and Consistent Seekers. The findings suggest that students' perceived difficulty of tasks and their understanding of the value of feedback significantly impact their likelihood of seeking it. Interestingly, even positive experiences with the platform and reported learning gains did not guarantee actively seeking feedback. These results highlight the need for educators to explicitly emphasise the importance of feedback and cultivate a learning

environment that encourages its utilisation. Additionally, the study suggests that interventions and the nature of the feedback itself (e.g., actionable feedback) may influence student engagement with feedback mechanisms. This study addressed the research gap on how learning analytics can be used to improve feedback practices in elementary education, a field with limited research in feedback literacy and learning analytics integration.

## **Design of an Approach to Identify ADHD in Students within a Pedagogical Setting**

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Children with Attention-Deficit/Hyperactivity Disorder (ADHD) often struggle to complete tasks that their peers without the disorder can easily finish. ADHD core symptoms are inattention, hyperactivity, and impulsivity, and these are often accompanied by learning difficulties and other behavioural problems. But ADHD is more than procrastination while doing homework and staying focused on tasks. It is a complex disorder that scientists are still unsure about the exact causes. Moreover, ADHD often occurs with other neurodevelopmental conditions such as Autism Spectrum Disorder (ASD) and Autism, which makes it difficult to detect.

Children with ADHD disorder are prone to academic difficulties that may lead to school dropout, drugs, and alcohol addiction. Literature has also documented that teachers are not sufficiently well-informed about the disorder to flag and report the possibility of ADHD presence in children. As such, children with ADHD go undiagnosed or are only diagnosed after causing harm to themselves and others. This issue causes a concern for children and for their families, which also has significant economic implications for parents and healthcare providers managing ADHD.

In this research, we proposed an approach to identify ADHD in children within a school setting through the use of a Serious Game (SG). Using OMEGA+, an educational game developed by Athabasca University, this research aims to analyze data from student gameplay to detect ADHD symptoms in students. The game is planned to be used in an educational setting and will use log data about students' behavior and performance to make a thorough assessment of ADHD. The real-time generated data will be analyzed using a combination of data-driven methods, specifically Machine Learning (ML) and Data Mining (DM) algorithms.

Our goal in implementing this approach is to improve the accuracy of detecting ADHD, providing researchers and clinicians with a valuable tool to gain deeper insights into ADHD symptoms. Furthermore, students can benefit greatly from an early ADHD diagnosis, as it can prevent the condition from worsening and provide them with access to specialized educational programs aimed at overcoming learning difficulties.

## Virtual laboratories – just a videogame genre?

**Ira Ekroth & Vesa Paajanen**

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Virtual laboratories are a rising trend in natural sciences of higher education. For example, at University of Eastern Finland STEM fields are seeing them as one solution for campus development. Virtual laboratories bring flexibility to teaching and motivate students with their gamification, which has been found to have a strong influence on the motivation to study natural sciences (Tomáska, 2022). Students often find virtual environments motivating (Coleman, S.K. & Smith, 2019; de Vries & May, 2019), but their importance as an aid to learning needs an even more detailed explanation. Virtual exercises are not suitable for practicing manual skills, which is why the goal of virtual laboratories is not to completely replace laboratory teaching. However, they make it possible for students living in another location to participate in the teaching and increase the combination of theoretical knowledge with practical applications. Virtual environments also enable teaching in situations where the use of laboratory animals should be avoided, and simulations enable endless repetition, which is not possible with traditional laboratory teaching. In addition, virtual tasks can be combined with sections requiring more analytical analysis and scientific writing than before, which help students with generic working life skills. We have evaluated the benefits of virtual simulations with a learning analytics approach and tested whether online laboratory work engages students in their study work. Pilot study was performed in the spring of 2023 on course in master level biology at University of Eastern Finland with 81 master level students from two universities and three campuses. This 8-week course was held in digicampus LMS with video lectures, online chat, weekly essay challenges and online/blended group works. Experimental and applying content was added in four weeks of the course by allowing student access to Labster virtual simulations. We tracked the study progress of voluntary students with learning analytics provided with digicampus and Labster, weekly feedback and Community of Inquiry survey (COL). The aim of the data collection was to detect the importance of students' background, use of material in LMS, procrastination, communication, and the use of virtual simulations on their ability to reach the learning goals of the course. Although virtual simulations were adding extra workload for students during the course, they increased the pass rate of flipped classroom students. Dropout rate decreased from 43 to 35 % and proportion of high grades increased from 44 to 75 % best subset regression had extremely high correlation ( $R^2 = 0,928$ ) and simulation related parameters were able to predict 91,7% of students learning outcome. Moreover, use of simulations and participation in the interactive elements of the course were among the best characteristics of predicting study success, and simulations were an important factor of course satisfaction at students' self-evaluations. Therefore, virtual simulations can help universities to engage students and help them to identify the experimental applications of lecture information, self-evaluate their knowledge and find motivation in the lecture parts of the courses. This can have large benefits for small universities or for multi-campus teaching.



## **Assessment of Accessibility in Virtual Laboratories: A Systematic Review**

**Fitsum Gizachew, Mohammed Saqr & Markku Tukiainen**

University of Eastern Finland, Finland

In an era of rapid evolution in educational technologies, Virtual Labs (V-Labs) have emerged as a promising solution, fundamentally altering how learners engage with scientific concepts and experiments. Despite their potential, ensuring their effectiveness and inclusivity in terms of accessibility to diverse students remains a challenging task. Currently, there is limited insight into the accessibility of V-Labs, a gap that our study aims to address. This study seeks to ascertain the effectiveness of V-Labs in terms of accessibility and inclusivity. We synthesized empirical studies, reviewing 36 articles published between 2000 and 2023. Of these articles, 69% of the studies were conducted in higher education and covered a wide range of learning environments. Our study revealed that 47.3% of the studies focused on various engineering subjects. Our findings provide insight into V-Labs' accessibility from four key perspectives: a) students with limited abilities, b) diverse cultural and linguistic backgrounds, c) instructional design features and content availability, and d) interaction supporting features. We also identified existing gaps in the accessibility of the V-Labs from the four perspectives. Furthermore, we examined the assessment methods of V-Labs, shed light on the aspects that are evaluated, and underscored the need for future work on assessment strategies.

## **Somekone: The Social Media Machine**

**Nicolas Pope, Anssi Lin, Eetu Arkko & Juho Kahila**

University of Eastern Finland, Finland

Social media platforms are influencing the daily lives of most people, including children. Teaching children the underlying mechanisms of social media platforms is essential for enabling critical, informed, and responsible use from an early age that does not rely on potentially harmful folk theories. Digital tools to support the teaching of these inner mechanisms at the proper abstraction level for classroom use do not currently exist. In response, the Somekone was created to allow tool-assisted classroom activities that familiarize students with the basic mechanisms of data collection, profiling, and recommendations on social media platforms. The Somekone was developed as a part of a larger project focused on creating materials and tools for teaching the necessary skills for children to interact with a data-driven society.

The tool offers a familiar image feed user interface where users can also interact with the images using actions commonly found on social media platforms, such as commenting and sharing. The image feed contains 727 images selected and labelled manually. Unlike real social media platforms, the tool stores all the collected data locally, thus eliminating privacy concerns. Visualizations are presented to the users from the perspective of three essential

social media concepts: data collection, profiling, and recommendation. Data is collected while users scroll through the image feed and factors such as time spent looking at a particular image are used to determine an engagement score for each individual image. Based on user interaction, a profile is constructed and presented using a word cloud with the image labels. More detailed visualizations of factors contributing to the profile are also available. Recommendations are visualized with a queue of upcoming photos and a rationale for their presentation.

The tool can be used with a single computer by multiple users. It is also possible to use one computer to scroll the image feed and a second to observe the data collection in real time using a peer-to-peer connection, enabling easier collaboration. In addition to the visualizations, a social network of profiles, clustered based on user similarity, can be observed in real time from the host computer as a graph. The combination of playful image feed scrolling, and real-time data presentation provides a hands-on learning experience with immediate feedback, cultivating understanding of how data is collected, used, and affects not only the user themselves but other users as well.

## **Optimizing Clinical Reasoning in Time-Critical Scenarios: A data-driven gamified multimodal approach**

**Sonsoles López-Pernas**

University of Eastern Finland, Finland

This presentation describes the recently funded project CRETIC, which aims to optimize clinical reasoning, decision-making, and emergency management in time-critical scenarios for healthcare students and trainees. The project will involve the development of an innovative gamified platform that combines virtual patients and educational escape rooms to provide unprecedented high-fidelity time-constrained clinical simulations. Multimodal data will be collected to capture the full breadth of the fine-grained dynamics of the clinical reasoning process and the emotional response that the clinician undergoes as the patient improves or deteriorates. State-of-the-art learning analytics methods and explainable artificial intelligence will be employed to map the clinical reasoning process and the contextual, cognitive, and emotional variables that facilitate or impede effective decision-making. The result will be an open scalable platform that will dramatically improve the training of medical emergencies, offer personalized insights into effective decision-making, provide a safe environment for practicing challenging clinical situations, and ultimately decrease medical errors, one of the leading causes of death worldwide. More importantly, the findings will provide unprecedented comprehensive insights into the cognitive mechanisms of clinical reasoning which have been so far poorly studied as a temporal process that unfolds in time and is affected by clinicians' emotions.



## SESSION 5

### University teachers' ethical perceptions of AI and their self-efficacy for using AI in teaching

**Sirkku Lähdesmäki, Sanna Väisänen & Heidi Hyytinen**

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Artificial intelligence (AI) ethics refers to the European Commission's shared requirements for the ethical use of AI (EU 2019; Unesco 2022). It's important for teachers to be aware of the ethical principles of AI to guide their actions. It is essential to emphasize the teacher's agency and oversight in the use of AI, as well as to ensure the transparency, traceability, explainability of AI systems, and to clearly communicate these aspects (Holmes et al. 2021).

It has been shown that the use of AI-based learning platforms can enhance the review of learning tasks, grading and personalization of curriculum content according to students' individual needs, improving the learning experience of students (Chen et al. 2020; Wang et al. 2023). However, the use of AI can lead to an increase in academic dishonesty, such as plagiarism, inequity in assessment, and biases (Fowler 2023). Hence, universities should take a proactive and ethical approach to use AI tools (Cotton et al. 2023). Teachers are in a key position to influence the competencies and attitudes of students and future academics toward ethics in AI, but their perspectives on these matters have not been thoroughly researched.

The rapid emergence and development of AI may also challenge teachers' self-efficacy for teaching. Self-efficacy refers to people's perceptions about their abilities to perform a particular task (Bandura 1986; 1997) and plays a mediating role in human actions, as it is related to the course of action taken and the level of effort (Barni et al. 2019; Cao et al. 2018). Furthermore, self-efficacy for teaching refers to teachers' belief of their ability to handle tasks, challenges and obligations related to teaching (Barni et al. 2019; Cao et al. 2018) and is connected to positive experiences of teaching (Gale et al. 2021). The present study utilizes the term self-efficacy for using AI in teaching when referring to self-efficacy beliefs for one's abilities to use and handle AI in their teaching.

The aim of the study is to explore university teachers' self-efficacy for using AI in teaching and their perspectives to AI ethics. This study is conducted in the Finnish research-intensive university 2024. Teachers' self-efficacy for using AI in teaching and AI ethics is measured by using modified Artificial Intelligence Literacy Questionnaire (AILQ; Ng et al. 2023) contextualized into Finnish higher education. The questionnaire also includes three open-ended questions allowing teachers to reflect their experiences and thoughts related to AI in teaching. Mixed-method approach combining both quantitative and qualitative analysis is applied.

Since the research is still in progress, only the expected results can be discussed here. Based on previous studies (e.g., Gale et al. 2021), it can be assumed that associations will be detected between university teachers' self-efficacy beliefs and positive experiences in using

AI in teaching. Supporting teachers' self-efficacy for teaching is important and challenges teachers to identify their perceptions related to the use of AI and its ethics. This study generates new knowledge that can be utilized in university pedagogical education and its development.

## **Exploring the development and impact of automated grading tools in education: strategies for AI-based assessment activities**

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The rise of AI in education has led to significant advancements, promoting automated grading to reduce educator workload and enhance pedagogy. However, its integration raises complex pedagogical, ethical, and technical questions. This systematic review examines the intersection of automated grading tool development and educational assessment through the lens of activity theory. Our analysis, informed by literature since 2010, reveals a critical need for comprehensive evaluation frameworks addressing the iterative nature of technology development and interdisciplinary collaboration. Key breakpoints in existing studies include oversight on the reliability and validity of assessments, ethical considerations, the need for formative assessments, interdisciplinary collaboration, and coherent evaluation rules. Addressing these issues requires a holistic approach that bridges technical and educational perspectives, fostering trust and supporting meaningful learning outcomes. Enhanced collaboration and ongoing professional development are crucial for creating AI-driven assessments.

## **Socially Accepted Boundaries For Using AI in Educational Contexts: Epistemic Network Analysis of Public Online Discussions**

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The utilization of big data and algorithm-based technologies, such as learning analytics (LA) and artificial intelligence (AI), has raised significant ethical concerns regarding their role in education (Carolus et al., 2023; Celik, 2023; Silvola et al., 2021). Integrating AI into educational practice highlights ethical issues related to bias, trust, authorship, equitability, and privacy (Howard et al., 2022; Li et al., 2023).

Use of AI occurs in a sociotechnical ensemble, where socially constructed boundaries determine how digital technologies should work (Bearman & Ajjawai, 2024). This raises a need to map and analyze how people position AI as part of different contexts and practices. The anthropomorphic nature of novel large language model (LLM) -based

conversational agents (CAs) sets a new dimension to ethical discussions. For example, there is a need to advance our current understanding about the transparency of AI technologies embedded in the systems people are operating with. These technologies stretch the traditional sociocultural boundaries guiding educational technology design and use. For instance, CAs are being considered for roles such as supporting students' mental well-being or mitigating loneliness, where such technologies have not been widely utilized previously, causing ethical considerations about the boundaries between human and technology in society (Maples et al., 2023).

In this study, we investigate the broader societal conversations about educational use of AI. By investigating online discussions of AI, we aim to identify different possibilities, limitations, values and concerns that guide how people think AI works in different contexts. Our research question is: What are the current socially accepted boundaries for AI use in educational contexts. To answer this, we employ Epistemic Network Analysis (ENA) on online discussions about educational use of AI, sourced from newspaper comment boards. Our study provides empirical evidence on the socially accepted boundaries for AI use in educational contexts, advancing the current knowledge of the risks and possibilities associated with employing AI to support learners.

## **AI and Higher Education Teachers: Expectations, Attitudes, and Ethics**

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Generative AI has become more relevant in the past years since ChatGPT took the public by storm in 2022 and businesses started to adapt generative AI into their functions in 2023. Higher education sector was no different, and in 2024 we are still implementing generative AI not only for the functions of our systems and services but also for our curriculum, teaching methods, and learning experience. This study was completed in the spring of 2024 by surveying 178 Finnish higher education institute (HEI) teachers about their use, expectations, attitudes, and ethics relating to generative AI. After analysis, we found out that while teachers are moderately aware of current AI tools, and very well informed about the secure and ethical use of the tools, very few of them use any AI tools frequently as part of their teaching. Still, the teachers see the importance of educating AI-related things to students. They are also optimistic about AI in the future: while they think that AI will significantly change education and work, they do not believe that AI will completely replace teachers.

## **“There are many opportunities ahead, if we can just harness them all”: Representations of Problems and Solutions in the Datafication of Education**

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The collection, generation, or recording of data in everyday school life — also called the datafication of education — has prompted stakeholders to imagine associated opportunities, aspirations, problems, and challenges. The promise of the advantages to be gained from seemingly "accurate" and "representative" digital data, such as the desire to tailor learning processes to personal preferences and to make data-driven educational decisions to optimize resources, is understandably appealing (Pangrazio & Selwyn 2020, p.14-16). However, it is essential to contest the underlying assumptions, as challenges have been identified both with datafication as well as data itself (see e.g., Mertala, 2021; Selwyn & Gašević, 2020). Challenges include the inherent difficulty in analyzing complex real-life phenomena such as learning and well-being (e.g., correlation is not causation), errors and bias in data, privacy concerns, data-driven subjectivity, and data as cognitive authority, to name a few.

This presentation introduces the data collection conducted in the MODALITY (Movement for Data Literacy) project, funded by the Research Council of Finland, in which we interviewed educational stakeholders (N=25), namely, EdTech professionals, data justice advocates, and policy representatives, about their expert views on the datafication of education. We focus on our early-stage analysis of the problematizations that stakeholders argue that datafication solves as well as the solutions described. The analysis employs Carol Bacchi's (2012) “what’s the problem represented to be?” framework to outline how emerging issues, which are not objective but socially constructed through discourse and interpretation, are framed through different subject positions. The preliminary RQs are: 1) What problems is the datafication of education presented as solving? 2) What solutions to these problems are proposed?

Initial analyses have shown that there is much talk of "solutions in search of problems" (see also Ideland et al., 2021); interventions and technologies are presented as without a clear account of the underlying problems they are intended to address. While some such rhetoric indicates an apparently unquestioned general intention to advance digitalization, some connotes opportunistic and utilitarian rather than problem-centric ideas, such as improving or maximizing outputs like learning outcomes generally (see also Eynon, 2022). In turn, there are defined problems that are expressed to call for datafication, such as the increase in school dropouts, the decline in students' well-being and academic performance, and the lack of aggregated information on educational matters (e.g., how special education support resources are distributed). Proposed solutions involve methods of digitally recording (possibly in an automated manner) various aspects of teachers' and students' lives and activities to, for

example, monitor, evaluate, and communicate what is happening in educational practice with expectations of increased knowledge, better decision-making, more control, or generally “making things easier” or “better”, among others. While there are justified expectations, some of the problems represented are formidable, and the feasibility of the solutions can be debated. In conclusion, the early findings suggest that there are numerous open questions, unquestioned basic assumptions, and contesting motives driving the datafication of education both in policy and practice.

## **A Scoping Review of Idiographic Approach in Education Research**

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The past decade’s data surge has spurred interest in precision education, aiming to tailor educational interventions to individual learners based on robust evidence. Precision education is powered by the increasing availability of educational data and advancements in computational analytics, promising personalised learning experiences that can enhance learning outcomes and promote equity. However, traditional methods, which rely on group-level nomothetic approaches, have faced significant challenges in generalisability, as they often fail to capture individual learning processes and diverse contexts in which learning occurs. We argue that these limitations necessitate a shift towards idiographic approaches that focus on person-specific insights through longitudinal data collection from a single individual learner. The idiographic methodology also holds the potential to promote inclusion as it enables deep, fine-grained and learner-centric personalisation. This paper systematically reviews the existing application of idiographic approaches in educational research to address the gap in understanding how these methods have been used and their potential for future research. The scoping review included 34 peer-reviewed articles that employed idiographic methods, revealing that idiographic approaches have been traditionally used to incorporate contextual factors and psychological dispositions unique to each learner. While idiographic research remains relatively scarce in education, the findings illustrate a growing trend that idiographic research is enriched by the increasingly available data and advanced computational techniques. Additionally, the findings highlight the need for future research to consider longitudinal within-person temporal processes, extend idiographic methodologies to K-12 education, and develop person-centred theories within educational psychology. These methods could also address inclusion by focusing on underrepresented populations such as learners with disabilities. In conclusion, idiographic approaches offer a promising complement to nomothetic approaches, providing personalisation that can enhance precision education and inclusion. Future research should explore the potential of idiographic methods to advance inclusive, personalised learning environments in the digital age.

