



IFIP TC3 WCCE 2026 Conference

19–22 October 2026
Kruger National Park, South Africa

Learnnected:
Empowering Education
in a Connected World

Book of Abstracts

Edited by
Riana Steyn
Lizette Weilbach
Machdel Matthee



Inspiring new ways

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Prof. Don Passey
Co-chair
IFIP TC3 WCCE 2026 IPC



Associate Prof. Amina Charania
Co-chair
IFIP TC3 WCCE 2026



Prof. Riana Steyn
LOC Chair
IPCIFIP TC3 WCCE 2026 IPC

Dear participants,

IFIP TC3 conferences seek to inspire and stimulate – and what better ways to inspire and stimulate than the place and the topic! This year, in 2026, thanks to the University of Pretoria, and the wonderful lead taken by Dr Riana Steyn, the National Representative for South Africa to IFIP TC3, we will hold the IFIP TC3 WCCE 2026 conference in the Kruger National Park, South Africa. The topic of the conference will be ‘Learnnetted: Empowering Education in a Connected World’.

The conference will provide opportunities to meet in a wonderful location, so that we can share and discuss our respective focuses and concerns on a particularly important topic. We all seek to manage education in a connected world, whatever our roles are in using digital technologies - whether they be as teachers, researchers, educational advisers, policy makers or parents and guardians. Please come along to the conference, and share your questions – but better still, offer a presentation!

Our particular thanks to all who make this conference possible – to our hosts at the University of Pretoria, to the Chair and Members of the Local Organising Committee and to the Co-chairs and Members of the International Programme Committee of the conference. Conferences do not happen without dedication, support and commitment of so many people, both organising locally and at a distance. Our thanks go out to everyone so generously providing their time and expertise.

We look forward to seeing you in the Kruger National Park in October 2026!

Prof. Don Passey, Co-chair of IFIP TC3 WCCE 2026 IPC, Chair of IFIP AMB, Chair of IFIP TA
Associate Prof. Amina Charania, Co-chair of IFIP TC3 WCCE 2026 IPC, Vice-chair of IFIP WG3.3



Local Organising Committee (LOC)

Local Organising Chair	Riana Steyn
Finance	Wesley Moonsamy
Logistics	Henk Pretorius
Registration	Machdel Matthee
Marketing/Communications	Nita Mennega
Website Administrator	Nita Mennega
Sponsorships/Exhibitions	Lizette Weilbach
Social Events and Local Arrangements	Rhona van der Merwe
Gifts	Lizette Weilbach
Book of Abstracts	Riana Steyn, Lizette Weilbach and Machdel Matthee

International Program Committee (IPC)

Co-chairs:

Prof. Don Passey
Lancaster University, United Kingdom

Prof. Amina Charania
Dublin City University, Ireland

Members:

Prof. Riana Steyn
University of Pretoria, South Africa

Prof. Christophe Reffay
University Marie and Louis Pasteur, France

Prof. Javier Osorio Acosta
University of Las Palmas de Gran Canaria, Spain

Dr Nicholas Mavengere
Bournemouth University, United Kingdom

Prof. Toshinori Saito
Seisa University, Japan

Doctoral Consortium Chairs

Prof. Javier Osorio Acosta
University of Las Palmas de Gran Canaria, Spain

Prof. Wande Daramola
University of Pretoria, South Africa

The on-site registration desk will be open in the foyer of the conference venue on the following dates and times.

15:00 – 17:00 on 18 October 2026

8:00 – 15:00 on 19 October 2026

8:00 – 15:00 on 20 October 2026

8:00 – 15:00 on 21 October 2026

9:00 – 12:00 on 22 October 2026

Name badge: Please always wear your badge during the conference.

Smoking Policy: Smoking is not allowed inside any buildings at the conference venue and accommodation. Designated smoking areas are available

Why South Africa?

South Africa: Where Learning Meets the Wild

South Africa offers a destination where extraordinary natural beauty, rich cultural diversity and intellectual curiosity come together. Hosting the World Conference on Computers in Education (WCCE 2026) in the iconic Kruger National Park provides delegates with far more than a conference venue; it offers an opportunity to experience one of Africa's most remarkable landscapes. The Kruger is renowned for its remarkable biodiversity and the opportunity to encounter the Big Five: lion, leopard, elephant, buffalo, and rhino, in their natural habitat. Its vast bushveld, spectacular sunsets and distinctive African atmosphere create an inspiring setting for reflection, conversation and new ideas. Here, the experience of learning extends beyond the conference room, offering a powerful reminder of the connections between people, technology, nature and society.

Bringing WCCE to South African soil is equally significant. As a global gathering of researchers, educators, practitioners and policymakers, the conference creates an important platform for African voices to contribute to international conversations about the future of education and technology. African education systems bring distinctive experiences, challenges and innovations to discussions on digital inclusion, equitable access, artificial intelligence and technology-enhanced learning. Hosting the conference in South Africa helps make these perspectives more visible, strengthens opportunities for collaboration between African and international scholars, and creates valuable opportunities for emerging researchers and doctoral students to participate in a global academic community.

Under the theme *Learnnnected: Empowering Education in a Connected World*, WCCE 2026 celebrates the potential of connection to transcend geographical and institutional boundaries. Its presence in Africa is an invitation to share knowledge across contexts, learn from diverse experiences and develop solutions that respond to the realities of our interconnected world. Ultimately, this gathering is not simply about bringing the world to Africa; it is about ensuring that Africa actively helps shape the world's educational future.



During your stay, you'll have the opportunity to embark on thrilling game drives, immersive guided walks, and unforgettable safari tours led by expert rangers. Booking of these activities is essential; enquire at the conference reception for more details. These experiences take you deep into the park's varied habitats, ranging from open savannas and riverine forests to rugged bushveld, where you can encounter Africa's most captivating wildlife, including the legendary Big Five. Whether you are a seasoned adventurer or a first-time visitor, each excursion promises moments of wonder, discovery, and connection with the wild.

Health and Safety

- Parts of the Kruger area fall within a malaria zone - consult your doctor about preventative medication.
- Stay hydrated, use sunscreen, and wear a hat to protect against the strong African sun.
- Always follow park rules: do not leave your vehicle outside designated areas and keep a safe distance from wildlife.

Crime Awareness

- South Africa has areas where crime can be a concern, but with common-sense precautions, most visits are trouble-free.
- Stay vigilant in cities: avoid displaying valuables, keep your bags close, and use hotel safes.
- When driving, keep car doors locked, and windows closed in urban areas.
- In the Kruger National Park itself, the focus is on wildlife safety rather than crime.

Transport and Driving

- South Africa drives on the left-hand side of the road.
- Road conditions are generally good, but wildlife and pedestrians may be encountered, especially near the park.
- Fuel stations are available in and around Kruger, but it's wise to fill up when you can.

Communication

- English is widely spoken, along with 10 other official languages.
- Local SIM cards are affordable and provide good coverage in towns; coverage inside Kruger can be limited.

General Tips

- Tap water is safe to drink in most parts of South Africa, including Kruger rest camps.
- Dress in light, breathable clothing during the day and bring a jacket for cool mornings and evenings.
- Binoculars, cameras, and guidebooks will enhance your safari experience.
- Respect the environment: do not litter, feed animals, or disturb the natural setting.

Do's

- Do stay inside your vehicle unless in designated areas.
- Do respect the speed limits (generally 50 km/h on tar roads, 40 km/h on gravel).
- Do keep noise levels down to avoid disturbing wildlife.
- Do use binoculars and cameras instead of approaching animals.
- Do plan your day around gate opening and closing times; late arrivals or exits are not permitted.

Don'ts

- Don't feed or touch the animals; this is dangerous for both you and them.
- Don't litter; help preserve the park's pristine environment.
- Don't block the road when viewing animals; allow other vehicles to pass.
- Don't get too close to wildlife, even in rest camps; baboons, monkeys, and other animals can be bold.
- Don't play music loudly or hoot; it disturbs both animals and fellow visitors.

Full paper presentation duration: 15 Minutes

Short paper presentation duration: 10 Minutes

Important: All presentations will be run from a central drive. We therefore ask all presenters to submit their presentation slides at the conference reception the day before their presentation.

DAY 1- MONDAY OCT 19

09:15 – 10:15	Opening Ceremony (Plenary Hall: Nari & Ndau)
10:15 – 11:15	Keynote & Discussion 1 (Plenary Hall: Nari & Ndau) Speaker: Mrs. Joice Benza (Online Stream) Title: 'Socio-Technical Landscapes and the Connected Future of Learning'. Chaired by Don Passey
11:15 – 11:30	Coffee & Networking Break
11:30 – 13:15	TRACK A: POLICY, STRATEGY & DIGITAL GOVERNANCE (INGWE ROOM) Chair: Deirdre Butler
11:30 – 13:15	AI Policy Implementation at School in International Comparison: Empirical Findings Based on ICILS Jan Niemann, Marius Domke, Kerstin Drossel and Birgit Eickelmann
11:30 – 13:15	Parents' and Educators' Attitudes and Concerns about Smartphones in South African High Schools Daniel Le Roux and Lana de Jong
11:30 – 13:15	To Ban or Not to Ban Smartphones and Restrict Digital Access: Ireland's Policy Dilemma Deirdre Butler and Margaret Leahy
11:30 – 13:15	The Urban–Rural Digital Divide in School Education: A Secondary Analysis of ICILS Data in an International Comparison Kerstin Drossel, Birgit Eickelmann and Jan Niemann
11:30 – 13:15	Advances in the Use of Information Technology in School Management over the Years: An Analysis Using Actor-Network Theory Arthur Tatnall and Javier Osorio
11:30 – 13:00	TRACK B: DIGITAL EQUITY, ACCESS & RURAL EDUCATION (MHELEMBE ROOM) Chair: Amina Charania
11:30 – 13:15	Newly qualified teachers' preparedness to teach with and through affordable digital technologies in marginalised communities in post-Covid-19 Agnes Chigona
11:30 – 13:15	Empowering Rural Education Through Digital Teaching and Learning Practices: A case in Nepal Sojen Pradhan, Max Hendriks and Sanjay Lama
11:30 – 13:15	Educators' readiness to impart cybersafety skills in connected learning: The case of marginalised schools Caroline Magunje and Wallace Chigona
11:30 – 13:15	Child Identity Fraud in the Era of Connected Learning Cynthia Sthembile Ntshangase and Riana Steyn
13:15 – 14:15	Buffet Lunch (Conference Restaurant)
14:15 – 16:00	TRACK C: CONNECTED LEARNING & PEDAGOGY IN AI ERA (INGWE ROOM) Chair: Torsten Brinda
14:15 – 16:00	When Connection Requires Refusal: Technology Back-lash, AI and the Future of Connected Learning Jason Zagami
14:15 – 16:00	AI-Mediated Connected Learning: Pedagogical Design and Teacher Identity Formation Jason Zagami

14:15 – 16:00	AI Literacy and the development of Pedagogical Content Knowledge in the Age of Generative AI Mary Webb, Kathryn MacCallum, Jodie Torrington, Deirdre Butler, Chris Shelton, Jihyun Lee, Tanya Linden, Jonathan D. Cohen, Ana Amélia Carvalho, Matt Bower and Fredrik Mørk Røkenes
14:15 – 16:00	Assessing What Matters in the Age of AI: A Comparative Analysis of Global Competencies in Final-Year Computing Exams in Australia and the United Kingdom Jackson Clayton, Therese Keane and Milorad Cerovac
14:15 – 16:00	Toward Adaptive Mathematics Learning Environments: Insights from a Systematic Review of Game-Based Learning and Social Robots Cherry Demir, Therese Keane and Milorad Cerovac
14:15 – 16:00	TRACK D: TANGIBLE CODING, GAME-BASED & PRIMARY CS (MHELEMBE ROOM) Chair: Lizette Weilbach
14:15 – 16:00	Coding Without Computers: A Thematic Analysis of Teacher Attitudes Before and After a Tangible Coding Workshop Using the Rangers Game Jean Greyling, Andre Calitz and Margaret Cullen
14:15 – 16:00	Comparing South African primary school teachers' tangible coding teaching practices across different socio-economic contexts Sumaiya Ismail and Machdel Matthee
14:15 – 16:00	What Makes a Context Work? Teachers' Perspectives on Everyday-Life References for Computer Science-related Learning in Primary Schools Felix Ziemann and Torsten Brinda
14:15 – 16:00	Parents as Mediating Actors in Primary Computer Science Education: A Systematic Literature Review Whitney Hachenberg and Torsten Brinda
14:15 – 16:00	Media Literacy Education Using Card Games and Its Potential Atsushi Hikita and Yumiko Ogata
16:00 – 16:15	Coffee And Networking
16:15 – 17:15	Guidance for submission of papers for the post-conference proceedings book by the chief editor, Professor Don Passey
17:30	Welcome reception

DAY 2 - TUESDAY OCT 20

09:00 – 09:15	Daily Reflections & Announcements (Plenary Hall: Nari & Ndau)
09:15 – 10:15	Keynote Speaker (Plenary Hall: Nari & Ndau) Speaker: Prof. Jean Greyling Title: 'Invention, Collaboration, and Code: Developing Tangible Computing in South Africa'
10:15 – 10:30	Coffee & Networking Break
10:30 – 12:10	TRACK A: GENAI IN HIGHER EDUCATION (INGWE ROOM) Chair: Christophe Reffay
10:30 – 12:10	The Buck Stops Here: A Human-in-the-Loop Blueprint for Teaching AI-Augmented Research in South Africa Brenda Scholtz and Lynn Fletcher
10:30 – 12:10	The role of generative artificial intelligence in learning computer programming: students' perceptions and reflections Janet Liebenberg and Marietjie Havenga
10:30 – 12:10	An Ethnographic Study of a First-Year Information Systems Module in the Age of Generative AI Malcolm Garbutt and Carolien van den Berg

10:30 – 12:10	Walking the Scene: Embodied Forensic Investigation Through Augmented Reality in a Narrative-Driven Platform Jarred Orfao and Wai Sze Leung
10:30 – 12:10	When AI becomes a Teammate: Negotiating the Role of Generative AI in Student Teams Lizette Weilbach and Adriana A Steyn
10:30 – 12:00	TRACK B: EDUCATIONAL MANAGEMENT, SUPERVISIONS & SCALING (MHELEMBE ROOM) Chair: Lizette Weilbach
10:30 – 12:00	An Investigation into 3rd Year and Honours Projects Supervision Management Practices in South Africa Andre Calitz and Margaret Cullen
10:30 – 12:00	The transitioning of third year Information Technology students to an honours programme and beyond Rudi Serfontein, Henri van Rensburg, J. Heystek Grobler, Lynette Drevin and Gunther Drevin
10:30 – 12:00	Scaling Laboratory-Based Teaching to Large Venues Without Computers: Efficiency and Impact on Student Performance Nita Mennega, Hanlie Smuts and Michael Bouwer
10:30 – 12:00	Deterministic Risk Scoring for Connected Early Intervention: An Equity-Driven, Multi-Domain Approach to First-Year Engineering Student Retention in South Africa Athenkosi Nzala, Unathi September and Malibongwe Manono
10:30 – 12:00	Doctoral Consortium (Room 3) Chaired by Javier Osorio and Wande Daramola
12:00 – 13:00	Doctoral Consortium (Rooms 2 and 3) Chaired by Javier Osorio and Wande Daramola
13:00 – 14:00	Lunch
14:00 – 15:00	Talk and Discussion – South African Perspectives Chair: Riana Steyn
14:00 – 15:00	INGWE ROOM Digital to AI Literacy and future capabilities, Curriculum, Assessment: South Africa focus
14:30 – 15:00	INGWE ROOM Talk and discussion: Madelein Meiring McGraw-Hill
14:00 – 15:00	Poster & Demo Session (FOYER)
14:00 – 15:00	Poster: Exploring Technostress in the Era of Generative Artificial Intelligence Vusumzi Funda
14:00 – 15:00	Poster: Integrating AI-powered Chatbots in Informal Digital Learning of English Pronunciation: A Participatory Study with Primary School Students Mengqi Fang
14:00 – 15:00	Poster: Teaching energy transition in Macaronesia with system dynamics and environmental learning computer simulation Javier Osorio
15:00 – 16:45	TRACK C: INFORMATION SYSTEMS & CYBERSECURITY EDUCATION (INGWE ROOM) Chair: Lynette Drevin
15:00 – 16:45	From Learner to Educator Student Experiences of Peer-Teaching in an Honours Computer Security Module Michael de Jager and Lynette Drevin
15:00 – 16:45	The Participation-Centered Learning Model (PCLM): A Conceptual Model for Undergraduate Information Security Education Michael de Jager
15:00 – 16:45	Reflections from Integrating Cybersecurity Awareness in a Higher Education Institution: A Case Study of a South African University Lynn Fatcher and Kerry-Lynn Thomson

15:00 – 16:45	Beyond Access. Learner Cyber-Safety Readiness for Connected Learning Godwin Mandinyanya, Wallace Chigona, Caroline Magunje and Laban Bagui
15:00 – 16:45	Cybersecurity Challenges and Maturity Considerations for Online and Hybrid Higher Education: A Scoping Review and Socio-Technical Mapping Nuraan Davids-Latief, Louis Fourie and José Frantz
15:00 – 16:45	TRACK D: ENGINEERING, VOCATIONAL & IMMERSIVE TECH (MHELEMBE ROOM) Chair: Christophe Reffay
15:00 – 16:45	The application of AI technologies as connected learning enablers in industrial engineering education Jacoba Bührmann and Maria van Zyl-Cillié
15:00 – 16:45	Making Thinking Visible in AI-Integrated Tertiary Vocational Education Bertram Haskins
15:00 – 16:45	A Prescriptive Framework for Designing Experiential Learning Interventions in Engineering Education in the Age of AI Tanya Kok, Maria van Zyl-Cillié and Jacoba Bührmann
15:00 – 16:45	Artificial Intelligence as a Facilitator of Vocational Science: A Conceptual Framework for Apprentice Learning Ann Baxter, Therese Keane and Stefan Schutt
15:00 – 16:45	A Comparison of the Use of GenAI Tools by Computer Science Students, Academics Teaching Programming Modules and IT Professionals in Industry Ines Oldenburg, Andre Calitz, Margaret Cullen and Jorge Marx Gomez
16:45 – 17:00	Coffee And Networking

DAY 3 - WEDNESDAY OCT 21

09:00 – 09:15	Daily Reflections & Announcements (Plenary Hall: Nari & Ndau)
09:15 – 10:15	TRACK A: DISTANCE LEARNING, PLATFORMS & FUTURE SKILLS (INGWE ROOM) Chair: Sharon Singh
09:15 – 10:15	Cognitive load, Immersive Technologies, and Inclusion: A synthesis and framework for Open Distance eLearning in Higher Education Charlotte Hlengwa
09:15 – 10:15	From Conceptual Model to Implementation: Evaluating Cross-Module Integration in Undergraduate Computing Education Luke Coetzee, Michael de Jager and Lance Bunt
09:15 – 10:15	AI and Human Skills development: Scenario planning of the future of Education 2030 Nicholas Mavengere, Toshinori Saito, Francis Manzira, Moses Moyo, Marie Collins, Atsushi Hikita, Daryl Hepting, Maina Muuro and Amit Pariyar
09:15 – 11:00	TRACK B: INTELLIGENT SYSTEMS, ASSESSMENT & GRADING (MHELEMBE ROOM) Chair: Mary Webb
09:15 – 11:00	Automated Grading and Feedback System for Students' Essays Kristoffer Hagen, Isah Lawal and Shahnaila Rahim
09:15 – 11:00	Evaluation of a Configurable Processor for LLM-Resistant Embedded Systems Assessment Gerrit Buter, Melvin Ferreira and Ashraf Sheri
09:15 – 11:00	Comprehensibility over Transparency: How South African Students Evaluate Explanations from an Education Recommender System Ayanda Ndlovu, Unathi September and Walter Ferreira Uys

09:15 – 11:00	Evaluating the Quality of Assessment Items Generated by Large Language Models for Large-Scale Educational Assessments Adilson Cruz, Isaura Alcina Martins Nobre, Marize Lyra Silva Passos and Mariella Berger
09:15 – 11:00	Bounded Professional Agency and Generative AI: Teachers Navigating High-Stakes Assessment Cameron Stow, Therese Keane, Alexia Maddox and Craig Deed
10:30 – 11:15	Coffee And Networking Break
11:15 – 12:00	Morning Short Paper Presentations (INGWE ROOM) Chair: Therese Keane
11:15 – 12:00	Chromebooks in Public Secondary Schools in India: A Case Study on Language Classroom Integration Amina Charania and Sumegh Paltiwale
11:15 – 12:00	Co-Constructing a Primary Data Literacy Framework: Lessons from Design-Based Research in the (Name of Project) Deirdre Butler, Janez Demšara, John Hurley, Claude Reuter, Ana Fariča, Aoife Flanagan, Anthony Kilcoyne, Borut Čampelj and Blaž Zupan
11:15 – 12:15	Designing Collaborative Introductory Informatics for Non-STEM Students in the Age of AI Takeshi Watanabe and Seiichi Tani
11:15 – 12:15	Building Teacher Self-Efficacy for Coding and Robotics Through Connected Professional Development: Evidence from a WhatsApp-Based Chatbot Intervention in South African Foundation Phase Education Embeth Holly Van der Wal, Ronel Callaghan and Jean Greyling
11:15 – 12:15	Teaching in the Feed: Authentic Digital Literacy Assessment in AI-Connected Learning Environments Maree Skillen
12:15 – 13:15	Workshop (INGWE ROOM)
12:15 – 13:15	From Tokens to Alignment: Exploring Large Language Models with TINA's Learning Journey Ralf Romeiki
12:15 – 13:15	Seminar/Panel (MHELEMBE ROOM)
12:15 – 13:15	Generative AI in Education: Towards Critical, Reflexive, and Ethical Pedagogical Practice Mary Webb, Sharon Singh and Deirdre Butler
13:15 – 14:15	Lunch
14:15 – 15:45	TRACK C: TEACHER TRAINING, CREATIVE MAKER TOOLS & ROBOTICS (INGWE ROOM) Chair: Machdel Matthee
14:15 – 15:45	Preparing Teachers for Teaching Advanced AI: Insights from a Professional Development Offer Franz Jetzinger, Sven Baumer and Tilman Michaeli
14:15 – 15:45	Students' and Teachers' Use of Generative AI in Computer Science Education in Schools - A Systematic Literature Review Dominikus Häckel and Torsten Brinda
14:15 – 15:45	Making the Connected World Tangible: Design Knowledge from a Smart-Home Robotics Lesson Series in Secondary Computing Education Jana Afreen Ahmed and Ralf Romeike
14:15 – 15:45	Moving from Cognitive Surrender back to Critical Thinking: Training GenAI Chatbots as Socratic Co-Facilitators Corna Olivier, Lizette Weilbach and Carina de Villiers
14:15 – 15:45	TRACK D: Computer science and computational thinking (MHELEMBE ROOM) Chair: Margaret Leahy
14:15 – 15:45	Narrativity in Computer Science Education: An Analysis of Bebras Tasks Michael Weigend
14:15 – 15:45	Students' Readiness for Nested Programming Constructs: A Qualitative Analysis Using the Computational Thinking Test (CTt) Jayanti Nayak, Therese Keane, Milorad Cerovac and Tanya Linden

14:15 – 15:45	The Impact of Educational Robotics on Computational Thinking Skills among STEM Students: Benefits and Challenges of Implementation Chinedu Okonkwo and Amos Anele
14:15 – 15:45	From Theory to Practice: Assessing Soft Skills through Continuous Assessment Using the "What, So What, Now What" Reflection Framework Adriana Aletta Steyn and Sollie Millard
15:45 – 16:15	Coffee And Networking
16:30	Depart for the Conference Bush Dinner

DAY 4 - THURSDAY OCT 22

09:00 – 09:30	Virtual Reflection & Key Takeaways of the 3 In-Person Days at the Conference (INGWE & Zoom A)
09:30 – 10:30	TRACK 1A: VIRTUAL SESSION 1A: PRIMARY/SECONDARY GENDER & TECH EDUCATION (INGWE ROOM & ZOOM A) Chair: Margaret Leahy
09:30 – 10:30	E-Learning for E-Gov in Post-Conflict Somalia via Learning Passport Mohamed Nuh and Mikko Ruohonen
09:30 – 10:30	Gender in AI Literacy Education: A Systematic Review on Girls, Artificial Intelligence Literacy, and Education in the Age of AI Cody Jackson, Therese Keane and Milorad Cerovac
09:30 – 10:30	Preparing Teachers in the Age of AI: a study with Portuguese trainees Ana Amélia Carvalho and Adelina Moura
09:30 – 10:00	TRACK 1B: VIRTUAL SESSION 1B: HIGHER EDUCATION PLATFORMS & LEARNING DATA (MHELEMBE ROOM & ZOOM B) Chair: Riana Steyn
09:30 – 10:00	Operationalizing Digital Competence in Higher Education: A Construct Validity Study Using Moodle Event Data Tsakani Justice Baloyi and Nazeer Joseph
09:30 – 10:00	Using Blackboard LMS with AI for Classroom Action Research Wesley Moonsamy, Hugo Lotriet and Hanlie Smuts
10:00 – 10:45	Coffee And Networking
10:45 – 11:30	TRACK 1C: Virtual Short Paper Session (INGWE ROOM & Zoom A Chair: Milorad Cerovac)
10:45 – 11:30	From AI Item Generation to Trustworthy Public Assessment: A Human-in-the-Loop Framework for Low-Resource Contexts Louisa Muparuri
10:45 – 11:30	Exploring Student Narratives of Generative AI Use in Academic Writing: Tensions Between Academic Integrity, Agency, and Identity Uchita Bakshani
10:45 – 11:30	Using a Wiki to Connect and Engage Students Daryl Hepting, Swe Zin Ei and Julia Hu
10:45 – 11:30	Conceptualisation of Early Childhood Teachers' AI Literacy in AI-Integrated Educational Practice Yuying Pei, Sarah Prestridge, Therese Keane and Susanne Garvis
10:30 – 12:30	DOCTORAL CONSORTIUM CHAIRED BY JAVIER OSORIO AND WANDE DARAMOLA (MHELEMBE ROOM & ZOOM B)

11:45 - 13:00	VIRTUAL ENGAGEMENT WITH CONFERENCE KEYNOTE SPEAKER (INGWE ROOM & ZOOM A) Chair: Amina Charania	13
11:45 – 12:30	Virtual Keynote Recording Viewing: Keynote highlights of Mrs. Joice Benza/ Prof. Jean Greyling Zoom A	
12:30 – 13:00	Live Q&A and Discussion with the Keynote Speaker (Zoom A)	
13:00 – 14:30	Afternoon Lunch/Coffee & Virtual Hybrid AGM Break (3.3 & 3.9): Zoom A and Zoom B	
14:30 – 16:00	TRACK 2A: VIRTUAL SESSION 2A: COMPETENCY PATHWAYS, TEACHERS & PRACTICE SCALING (INGWE ROOM & ZOOM A) Chair: Torsten Brinda	
14:30 – 16:00	Explicating AI Systems as Curricular Objects of Reference: Deriving the Computing Dimension of Teachers' AI Competence Across Subjects Uwe Lorenz	
14:30 – 16:00	Gender Differences in Adolescent Students' Interactions with Project-Based Learning with Technology Vinay Lautre, Amina Charania and Sandeep Wadhe	
14:30 – 16:00	Competency-Aligned Learning Pathways for AI in Secondary Computer Science Education Stefan Pasterk, Corinna Mößlacher and Andreas Bollin	
14:30 – 16:00	Recommendations for Scaling, Modification and Sustainability of Video based or Similar Programmes in Government-Run Middle and Secondary Schools in India Amina Charania, Durba Sarkar, Jayanth Nadheri and Bushra Parveen	
14:30 – 16:00	TRACK 2B: VIRTUAL SESSION 2B: ACADEMIC INTEGRITY, INFORMATION TRUST & ROLE SHIFTS (MHELEMBE ROOM & ZOOM B) Chair: Sharon Singh	
14:30 - 16:00	A Consideration of Local Echo Chambers in Information Trust Evaluation: Through a Case Analysis of Literacy Education Sayaka Tohyama and Jun Ichikawa	
14:30 - 16:00	Ensuring Academic Integrity in the Age of Voice Cloning: Evaluating Verbal Verification for Micro-credentials. Oyena Mahlasela and Riana Steyn	
14:30 - 16:00	From Displacement to Evolution: Unbundling the Educator Role under AI-Enabled Learning Gabriel Hoffman and Adheesh Budree	
14:30 - 16:00	Official Conference Closing Ceremony Programme co-chairs and team, Local chair and team, TC3 chairs	
16:00 - 16:30	Coffee And Networking	



Strengthening Africa's Digital Leadership Pipeline: IFIP Progress 2025–2026

By Mrs Joice Benza

Managing ICT Consultant (CEO) at X-Pert Solutions and IFIP Vice President



Abstract

Africa has made significant progress in ICT capacity development over the past year through targeted initiatives of the International Federation for Information Processing (IFIP). This presentation highlights key achievements in several priority areas encompassing: the IFIP funded Masters in ICT Scholarship Programme, the expansion of IFIP member societies across the continent, the continental ICT research-based progress report, as well as the focus on the recently launched IFIP Women in ICT Africa.

The scholarship programme is supporting a growing cohort of African postgraduate students specialising in digital governance, cybersecurity, AI, and ICT4D, with early outcomes showing stronger research output, improved mentorship pathways, and increased engagement with IFIP.

In this context, the keynote highlights IFIP's proposed support for African governments' advanced efforts to expand connectivity into rural and underserved communities through the IFIP digital equity initiatives. This support will help further narrow the continent's digital divide. By championing planned initiatives for African women and girls in STEM, IFIP will strengthen its impact and visibility. Selected case studies will also be presented as evidence that this objective is achievable.

In parallel, IFIP's footprint in Africa has expanded through revitalised and newly onboarded member societies, strengthening regional collaboration and alignment with global ICT standards. This update outlines progress, challenges, and opportunities for scaling IFIP's impact, demonstrating Africa's growing contribution to global ICT knowledge networks and the WCCE 2026 vision of empowering education in a connected world. When global collaboration meets local commitment, digital transformation should accelerate.

Biography

Joice Benza is a Managing ICT Consultant, transformation leader, strategist, and researcher specialising in digital governance, ICT leadership, and professionalisation across Africa. She is widely recognised for advancing digital skills, inclusion, and equitable access to technology, with a particular focus on women in ICT and narrowing the digital divide. Her work spans digital transformation, AI, policy, and capacity development, contributing to stronger digital ecosystems and Africa's participation in the global digital economy. Through her work with IFIP, she supports ICT education, professional development, and the advancement of Africa's next generation of digital leaders. Joice is the current IFIP Vice President for Africa, an IFIP IP3 Board member, and Zimbabwe's IFIP General Assembly Representative. She also chairs the IFIP Women in ICT Africa Task Force, championing STEM empowerment for girls and women. As Immediate Past President of the Computer Society of Zimbabwe, she founded Women in ICT Zimbabwe and serves on several boards, including AFC Insurance Limited, Zimbabwe.



Think Code Solve – under a tree

By Prof Jean Greyling

Head of the Department of Computing Sciences at Nelson Mandela University, South Africa



Abstract

From around 10 years ago, the term which all politicians, academics and thought leaders used to throw in regularly was the “Fourth Industrial Revolution” (4IR). Suddenly, we hardly hear anyone referring to the 4IR anymore – it has now been replaced by “Generative AI”. Not a conference goes by without papers on topics such as “The role of AI in ...”. This is obviously also true for computer education conferences.

In my talk, I want to reflect on what this current focus implies for a continent where millions receive their education in schools with limited resources – sometimes even under a tree. There is a clear pushback against uses of digital technology in education, with slogans referring to “low tech – no tech” becoming popular, while the value of physical books above tablets is being recognized.

Why is “Think Code Solve” (or basic problem-solving) so important within the AI revolution, and how do children learn to think, code and solve problems without a computer laboratory or internet connectivity?

The Tangible story of how unplugged coding has impacted code education across 5 continents will be offered in the talk as an important case in point.

Biography

Prof Jean Greyling is Head of the Department of Computing Sciences at Nelson Mandela University. Throughout his career, he has been interested in inclusive education. For the past 25, years he has been marketing the computing discipline and his department throughout the Eastern Cape province, often in under-resourced schools. During the years of MXit's instant messaging system, he and his students initiated various projects, primarily reaching out to rural learners. Their MXit “Tech Dictionary” at one stage had as much as 100,000 queries per month. Inspired by a postgraduate project by one of his students in 2017, Byron Batteson, Prof Greyling initiated the current Tangible movement, which focuses on unplugged, offline activities to introduce coding and problem-solving to learners. The movement, implemented by the NPO Leva Foundation, has a footprint over 5 continents, culminating every year in the Tangible Coding World Cup.



Doctoral Consortium:

Chaired by Javier Osorio and Wande Daramola

The WCCE2026 Doctoral Consortium aims to provide a supportive environment that will enable doctoral students to get constructive feedback on their research. Students will have the opportunity to discuss their work with experienced members, offering expert feedback, as well as peer feedback from fellow PhD students.

Workshop:

From Tokens to Alignment: Exploring Large Language Models with TINA's Learning Journey

Ralf Romeike

Large Language Models (LLMs) are now part of many everyday AI applications, yet their underlying principles often remain difficult to grasp for learners and teachers. Discussions of generative AI in education therefore tend to focus on use, prompting, risks, or policy questions, while the computational concepts behind these systems remain abstract. This workshop introduces TINA's Learning Journey, a teaching concept, visual representation, and set of hands-on activities for making central LLM concepts accessible in secondary computing education and teacher education. TINA is a fictional language model in training. Participants follow her journey from an initially untrained model through pre-training, fine-tuning, and alignment. Along the way, concepts such as tokenization, word prediction, embeddings, positional encoding, attention, task and domain tuning, and different forms of alignment are introduced. The narrative structure connects these concepts to the development of a modern AI assistant and makes them accessible without requiring advanced machine learning knowledge. The workshop combines a short introduction to the TINA poster and materials with selected hands-on activities. Participants experience the materials from a learner's perspective by experimenting with tokenization and word prediction, representing semantic relationships, exploring attention through sentence examples, and discussing how fine-tuning and alignment influence model behaviour. Visual metaphors, word and sentence cards, small-group discussion, and short role-play activities make otherwise abstract concepts tangible. The approach has been used and refined in several professional development workshops with computing teachers. In the WCCE workshop, participants will explore the materials, reflect on their didactic potential, and develop ideas for adapting the approach to their own educational contexts. The workshop thus connects conceptual understanding of LLMs with informed and critical engagement with generative AI. The workshop is intended for computing educators, teacher educators, curriculum developers, and researchers interested in AI education. It is designed for 90–120 minutes with up to 25 participants.

Keywords: Large Language Models; AI Literacy; Computing Education; Teacher Education.

Seminar/Panel:

Generative AI in Education: Towards Critical, Reflexive, and Ethical Pedagogical Practice

Mary Webb, Sharon Singh and Deirdre Butler

Recent developments in AI have generated considerable controversy, and divergent views, particularly in education. Generative AI (GenAI) is rapidly embedding itself in educational practice, typically framed through narratives of efficiency, productivity, and inevitability. Within these framings, educators and learners are positioned as consumers of AI systems — engaging with outputs while the broader conditions of GenAI development remain obscured. TC3 Working Group 3.9 on AI in Education has undertaken a collective writing project in which members examine and reflect on their experiences and dilemmas in exploring teaching and learning activities in relation to GenAI. Members are experienced educators with deep expertise in digital technologies, representing multiple countries and all phases of education, bringing a rich diversity of pedagogical contexts to the exploration of GenAI's role in teaching and learning. The project goes beyond asking how we use GenAI to ask how we can engage with it pedagogically — specifically, how educators and learners can engage critically with GenAI in ways that make visible the socio-material and environmental conditions of GenAI systems. The approach is informed by critical digital pedagogy, foregrounding agency, reflexivity, ethical judgement, and disciplinary meaning-making. Rather than presenting a unified framework or model of "best practice", our aim

is to surface a plurality of pedagogical stances that reveal the tensions, uncertainties, and possibilities of working with GenAI in education. Attention is given to how pedagogical practices can make visible what GenAI systems often render invisible - including their underlying infrastructures, assumptions, and wider socio-material implications. Among these, the environmental costs of GenAI — including energy consumption, water usage, and carbon emissions — represent a significant and underexamined dimension. By positioning pedagogy as a site of critique, negotiation, and intentional design, we aim to contribute to ongoing discussions in post digital and critical EdTech research. In this expert panel, members of WG 3.9 will examine issues, dilemmas, and solutions drawn from their own experiences, peer discussions in our collective writing project, and wider research. A substantial roundtable discussion will address the overarching question: What can and should TC3, as the educational committee of the International Federation for Information Processing (IFIP), do to support teachers throughout their pedagogical journeys with GenAI?

Keywords: Critical Digital Pedagogy; Generative AI In Education; Environmental and Socio-Material Impacts.

Abstracts

The abstracts are arranged based on the conference days and related sessions.

Conference day 1: Monday 19 October 2026

11:30 – 13:15

Track A: Policy, strategy and digital governance (INGWE ROOM) | Chair: Deirdre Butler

AI Policy Implementation at School in International Comparison: Empirical Findings Based on ICILS

Jan Niemann, Marius Domke, Kerstin Drossel and Birgit Eickelmann

The growing use of artificial intelligence (AI) in schools has increased the demand for policies that support students' pedagogically appropriate and responsible engagement with AI technologies. Drawing on data from the AI addendum of the International Computer and Information Literacy Study 2023 (ICILS 2023), this contribution examines the current state of AI policies and related personal, school-level, policy-related, and external factors, and analyses their relevance to AI policy implementation in schools. Analyses are based on principal questionnaire data from 12 participating education systems. Descriptive statistics and t-tests are used for international comparisons, while linear regression analyses identify factors connected with policy implementation. The findings show that student use of ChatGPT or similar tools is already widespread, whereas formal AI policies, information from education authorities, and curricular integration of appropriate AI use remain limited. Regression results indicate that curricular inclusion of appropriate AI use is the strongest predictor of AI policy implementation, followed by principals' work-related use of ChatGPT and their positive views of AI. Student use and information from education authorities do not show significant relationships. Overall, the results suggest that AI policy implementation is still emerging internationally and depends on the interplay of curricular orientation, school leadership, and system-level support.

Keywords: Artificial Intelligence; Policy Implementation; Linear Regression; ICILS 2023.

Parents' and Educators' Attitudes and Concerns about Smartphones in South African High Schools

Daniel B. le Roux and Lana De Jong

Over the past decade, adolescent smartphone ownership, use, and dependence have risen sharply. While these devices provide numerous benefits, parents often voice concerns about their effects on cognitive development and wellbeing. In schools, smartphones present both opportunities and challenges for educators. As key stakeholders, parents and educators not only shape high school phone policies but are also affected by them in various ways. This study explored parents' and educators' perceptions, attitudes, and concerns regarding learners' phone use in South African high schools. We conducted a thematic analysis of responses to open-ended questions from online surveys completed by 203 educators and 2,264 parents. Findings show that both groups recognise the educational potential of smartphones but remain uncertain about how to realise these

benefits in practice. Parents emphasise the communicative value of learners taking phones to school and their role in supporting child safety and security. Both groups express strong awareness of potential drawbacks: educators highlight distraction and overreliance, while parents raise concerns about social media and its impact on adolescents' social, psychological, and physical wellbeing. Despite these challenges, both groups favour restrictive policies over outright bans and acknowledge the difficulty of effectively implementing phone restrictions at school and at home. There is also strong agreement that adolescents need to develop the important ability to self-regulate their phone use habits to avoid the displacement of time spent on schoolwork, extracurricular activities and face-to-face socialisation.

Keywords: Smartphone Use; Adolescent Wellbeing; School Phone Policies; Parental And Educator Perceptions; Digital Self-Regulation.

To Ban or Not to Ban Smartphones and Restrict Digital Access: Ireland's Policy Dilemma

Deirdre Butler and Margaret Leahy

Debates concerning children's smartphone use and social media access have broadened beyond school-level management to encompass learning, wellbeing, online safety, privacy, platform accountability and children's rights. This paper examines how selected international and European jurisdictions regulate two related but analytically distinct domains: school-based smartphone use and age-based access to digital and social media services. Drawing on a targeted comparative policy review of official government publications, education ministry guidance, legislative and parliamentary records, European policy materials, research literature and reputable reporting, it classifies measures as binding legislation, national policy or guidance, regional or school-level action, or proposals under discussion. Jurisdictions are mapped according to the strength and centralisation of school-based smartphone restrictions and the maturity of wider age-based digital-access regulation. The analysis indicates that school-based smartphone restrictions are widespread, although their scope, enforcement mechanisms and permitted exceptions vary substantially. By contrast, measures governing age-based digital access for those under 16 are more recent, less consistent and more contested, particularly in relation to age assurance, proportionality, enforceability, platform responsibility and children's rights. International models range from decentralised approaches centred on school-based smartphone restrictions to more integrated systems combining school controls with obligations for platforms or device providers. Across Europe, national school-based smartphone restrictions coexist with regional, locally determined and guidance-led arrangements. At the same time, wider age-based digital-access regulation remains uneven and closely connected to EU frameworks governing data protection, online safety and platform accountability. Within this varied policy landscape, Ireland occupies a comparatively cautious position, combining mandatory school policy requirements with substantial local discretion and an EU-aligned approach to wider age-based digital-access regulation. Taken together, the comparative findings support greater national coherence across these distinct policy domains, but not an inflexible, uniform prohibition. A national reference framework could establish minimum expectations while accommodating age-related differences, inclusion, special educational needs, emergency communication and pedagogically justified digital use. It should also distinguish device restriction from digital readiness. Although limits on unstructured, distracting or commercially driven access may support attention and social interaction, they should be accompanied by purposeful, teacher-led development of AI literacy, data literacy, ethical reasoning, privacy awareness and critical evaluation. Future policy should therefore be evidence-informed, rights-sensitive and subject to regular review, with its effectiveness judged not by compliance alone but by whether it advances learning, wellbeing, inclusion, participation, learner agency and equitable implementation.

Keywords: Smartphone Restrictions; Policy; Schools.

The Urban–Rural Digital Divide in School Education: A Secondary Analysis of ICILS Data in an International Comparison

Kerstin Drossel, Birgit Eickelmann and Jan Niemann

This study investigates the urban-rural digital divide in school education through a secondary analysis of data from the International Computer and Information Literacy Study (ICILS 2023), encompassing worldwide 34 educational systems, thereby providing internationally comparative evidence on educational inequalities in digital access and competences and contributing to a better understanding of how geographical contexts shape students' opportunities for participation in an increasingly digitalized society. Adopting van Dijk's current five-dimensional framework of the digital divide, we examine disparities across attitudes, physical access, digital competences (Computer and Information Literacy and Computational Thinking), ICT usage, and outcomes,

using descriptive statistics and t-tests to identify and compare urban-rural differences across educational systems. The findings reveal that a universal 'urban advantage' does not exist; instead, the results are highly context-specific and country-dependent. While a clearer urban advantage is evident in the dimension of digital competences, where urban students out-perform their rural peers in the majority of countries, differences in physical access, attitudes, and usage patterns are inconsistent or weak. The study concludes that digital inequalities in schools are embedded within broader pedagogical and institutional contexts, suggesting that policy efforts to reduce these disparities must prioritize competence development and pedagogical integration over technical infrastructure alone.

Keywords: Digital Divide; Differences Urban/Rural; ICILS 2023.

Advances in the Use of Information Technology in School Management over the Years: An Analysis Using Actor-Network Theory

Arthur Tatnall and Javier Osorio

This paper analyses how technologies have progressively reconfigured school management over more than a century, using Actor-Network Theory (ANT) to link historical stages of technological development with changing roles of human and non-human actors. It traces a trajectory from analogue tools and early office machines to, mainframes, microcomputers, networked school management information systems, mobile platforms, software suites and the recent surge of generative artificial intelligence. Across these phases, information technologies are shown to act as mediators that redistribute tasks, competencies and power among managers, administrators, families, vendors and infrastructures, while also extending managerial networks beyond the school. The analysis highlights growing dependency on large EdTech platforms and the ambivalent consequences of continual updating, including efficiency gains, datafication, governance shifts, capacity gaps and new inequities. The paper argues that school management should be understood as an ongoing socio-technical network-building process, raising critical questions for future AI-driven developments.

Keywords: Actor-Network Theory; School Management; Information Technology; Edtech Platforms; Generative Artificial Intelligence.

11:30 – 13:00

TRACK B: DIGITAL EQUITY, ACCESS & RURAL EDUCATION (MHELEMBE ROOM) | Chair: Amina Charania

Newly Qualified Teachers' Preparedness to Teach with and Through Affordable Digital Technologies in Marginalised Communities in Post-Covid-19

Agnes Chigona

The COVID-19 pandemic accelerated the digital transformation of education and highlighted the critical role of technology in supporting teaching and learning during times of disruption. However, the shift to remote teaching also exposed significant inequalities in access to digital resources, particularly in marginalised and under-resourced communities. Although affordable digital technologies such as mobile phones were widely available, many teachers lacked the pedagogical knowledge required to integrate these tools effectively into curriculum delivery, resulting in substantial learning loss among learners in less affluent contexts. Teacher education programmes therefore face the challenge of preparing prospective teachers to teach with and through affordable digital technologies in ways that are adaptable, contextually relevant, and responsive to changing educational environments. Future teachers require a flexible mindset, digital pedagogical competence, and the ability to connect content, pedagogy, and technology to support learning when conventional classroom teaching is disrupted. This study explores the preparedness of newly qualified teachers to integrate affordable digital technologies in marginalised communities in the post-COVID-19 era. Guided by the research question: *How prepared are newly qualified teachers to teach with affordable technologies in marginalised communities in post-COVID-19?* the study employed a qualitative research approach. Data were collected through in-depth individual interviews with conveniently sampled newly qualified teachers. The findings indicate that newly qualified teachers are inadequately prepared to teach with and through digital technologies in under-resourced contexts. A key contributing factor is the limited emphasis on mobile

technologies in teacher preparation and the insufficient modelling of digital pedagogies during pre-service training. The study argues that teacher education programmes should place greater emphasis on affordable and accessible technologies, particularly mobile devices, to enhance digital inclusion and ensure quality teaching and learning in marginalised communities.

Keywords: Affordable Digital Technologies; Digital Pedagogy; Marginalised Communities; Newly Qualified Teachers; Teacher Education; Technology Integration.

Empowering Rural Education Through Digital Teaching and Learning Practices: A case in Nepal

Sojen Pradhan, Max Hendriks and Sanjay Lama

The education sector has experienced significant changes with the integration of digital technologies in schools globally. Teaching and learning practices have shifted from teacher-led to a student-centred approach. Effective learning occurs where meaningful interactions among students, teachers, and relevant resources are present, which can be facilitated by emerging digital technologies. Field observations in rural Nepal indicate that, despite basic digital infrastructure, the potential of technology remains underutilised due to limited interactive communication with students and predominantly one-way, teacher-centred instruction. Drawing on Actor Network Theory, this study examines the impacts of extending Wi-Fi connectivity, distributing digital devices in schools, and providing teacher training in digital pedagogy. Three different secondary schools of Manthali municipality in Nepal were selected for this study by focusing on how these interventions were shaped by interactions among human and non-human actors particularly digital technologies. Participants responded positively to the survey questionnaire and reported improvements in how they prepare for and conduct classroom activities.

Keywords: Digital Technologies; Teaching And Learning Practices; Rural Schools; Actor Network Theory; Nepal.

Educators' readiness to impart cybersafety skills in connected learning: The case of marginalised schools

Caroline Magunje and Wallace Chigona

Connected learning has revolutionised education, with marginalised schools benefiting from increased access to learning resources, as they would normally struggle due to a shortage of textbooks. Furthermore, remote learning has improved access to educators who can still guide learners beyond the classroom. Secondary school learners are also increasingly using online platforms for communication and entertainment. However, accessing and using cyberspace exposes learners to cyber-attacks and risks. Cybercriminals thrive on the weakness of online users to perpetrate various attacks, including cyberbullying, identity theft and sextortion. As educators teach learners online, they are best placed to impart cybersafety knowledge and skills to ensure learners stay safe while using online platforms. However, marginalised schools operate under resource-constrained conditions, which may limit their access to cybersafety training and initiatives to build educators' capacity. This study, therefore, seeks to explore the readiness of educators in marginalised schools to impart cybersafety skills in connected learning. Using the theory of planned behaviour, we explored how attitude, subjective norms and perceived behavioural control lead to the performance or non-performance of imparting cybersafety skills by educators as a behaviour within a marginalised school context. We employed a qualitative, interpretive approach and collected data through semi-structured interviews from secondary schools in the Western Cape and Limpopo provinces of South Africa. The study showed that educators were aware of the dangers learners face when using the internet, including the possibility that learners might be perpetrators of cyberbullying and cyber harassment. However, because authorities have not prioritised cybersafety in connected learning, there has been a lack of cybersafety training and awareness, which in turn has created a negative attitude among educators towards imparting cybersafety to learners. Some educators, however, are willing to impart cybersafety to learners despite the challenges in their context. We therefore propose a peer-to-peer mentoring and cybersafety community of practice, grounded in the Theory of Planned Behaviour, to strengthen educators' cybersafety teaching.

Keywords: Cybersafety; Connected Learning; Marginalised Schools.

Child Identity Fraud in the Era of Connected Learning

Cynthia Sthembele Ntshngase and Adriana Aletta Steyn

Identity fraud has become one of the most persistent and complex cyber-enabled crimes, increasingly affecting not only financial and governmental systems but also connected digital learning environments where identity integrity supports access, participation and trust. Its rapid evolution, driven by technological innovation and systemic vulnerabilities, demands urgent scholarly and practical attention to strengthen prevention and governance frameworks. This study conducts a PRISMA-guided systematic review of academic and industry sources (2020-2026), examining fraud types and actors, with a specific focus on how these frauds intersect with children in education systems and digital learning platforms. The findings show that major fraud types including synthetic identity fraud, financial identity fraud, document-based fraud, and account takeover, have significant but underexplored implications for children in education systems. These include the creation of fraudulent learner identities, unauthorized access to digital learning platforms, manipulation of enrolment processes, and long-term exploitation of child identity data. The analysis further emphasizes the role of multiple actors, showing that child identity fraud involves a complex set of actors, including peers, classmates, friends, family members, people with inside access, and even strangers, whose interactions contribute to identity-related risks within connected learning ecosystems. The study contributes by recommending a child centric procedure for assessing identity fraud risk in education that supports the secure design and governance of digital education ecosystems, enabling policymakers, educators, and platform developers to safeguard identity integrity.

Keywords: Identity Fraud; Identity Theft; Actors; Equity; Children; Learning, Education.

14:15 – 16:00

TRACK C: CONNECTED LEARNING & PEDAGOGY IN AI ERA (INGWE ROOM) | Chair: Torsten Brinda

When Connection Requires Refusal: Technology Backlash, AI and the Future of Connected Learning

Jason Zagami

Connected learning has offered education a productive account of networked possibility: learners connect interests, peers, mentors, communities, institutions, production and recognised opportunity. Generative artificial intelligence complicates this account because educational connections can now be generated, automated, personalised and simulated. AI systems may extend access to feedback, translation, explanation, design, collaboration and knowledge production, yet they may also weaken trust, authorship, assessment validity, teacher authority, student agency and public confidence in education. Technology backlash is no longer speculative. It is visible in school phone bans, restrictions on classroom screen use, concerns about AI-assisted assessment, student opposition to AI in creative courses, and renewed public debate about whether digital systems serve or distort educational purposes. The argument developed here is that connected learning in the age of AI requires a theory of defensible refusal. Refusal is not the opposite of connection and is not evidence of adoption failure. In AI-mediated education, principled refusal may be one of the conditions that make connected learning trustworthy. Yet if refusal hardens into a broad educational or social posture, it may deepen inequality, displace AI use into private and unregulated spaces, weaken public technological capability and narrow education's capacity to shape technological futures. Drawing on connected learning theory, technology refusal, digital non-use, critical educational technology, AI literacy and current examples of educational backlash, the analysis develops the Refusal-Capable Connected Learning Cycle. The contribution is a theoretical reorientation of connected learning from more connections toward trustworthy connections.

Keywords: Connected learning; AI refusal; Technology backlash; Generative AI; Educational technology; Teacher judgment; Digital citizenship; Trust.

AI-Mediated Connected Learning: Pedagogical Design and Teacher Identity Formation

Jason Zagami

Connected learning has long promised a more open, networked and participatory account of education, linking learners' interests, supportive relationships and opportunities. Generative artificial intelligence unsettles this

promise because connection is no longer only social, institutional or cultural. It is increasingly algorithmic. Learners are now connected to synthetic content, automated feedback, recommender systems, adaptive interfaces and data-driven representations of their own progress. These developments create possibilities for more flexible, inclusive and personalised learning, yet they also risk producing the illusion of learning where fluent outputs mask weak understanding, fragile agency or unexamined dependence. The argument developed here reframes AI-mediated connected learning as both a pedagogical design problem and a teacher identity formation problem. Drawing on connected learning scholarship, ecological teacher agency, teacher identity research, AI literacy, assessment scholarship and the Australian policy context for generative AI in schools, the analysis develops an integrated framework for initial teacher education. The framework positions AI literacy as networked professional judgment and argues that preservice teachers must learn not only how to design with AI, but who they are becoming as teachers when explanation, feedback, production and assessment are increasingly AI-mediated.

Keywords: Connected Learning; Artificial Intelligence; Teacher Agency; AI Literacy; Initial Teacher Education; Professional Judgment; Digital Equity; Assessment; Teacher Identity.

AI Literacy and the development of Pedagogical Content Knowledge in the Age of Generative AI

Mary Webb, Kathryn MacCallum, Jodie Torrington, Deirdre Butler, Chris Shelton, Jihyun Lee, Tanya Linden, Jonathan D. Cohen, Ana Amélia Carvalho, Matt Bower and Fredrik Mørk Røkenes

This paper examines how Generative Artificial Intelligence (GenAI) in K-12 education interacts with teachers' Pedagogical Content Knowledge (PCK). Using the Refined Consensus Model (RCM) as an analytical framework, we analysed how GenAI influences PCK domains: personal PCK (pPCK), collective PCK (cPCK), and enacted PCK (ePCK). Guided by the research question 'How can teachers and GenAI collaborate to develop and use PCK and pedagogical reasoning in K-12?', we analysed three researcher-constructed vignettes — hypothetical but plausible scenarios representing GenAI use in planning, classroom interaction, and assessment — to derive analytical propositions about the PCK-GenAI relationship. Our analysis reveals tensions between traditional PCK boundaries and GenAI-mediated practices, and proposes that GenAI can amplify teachers' PCK when critically evaluated, but poses risks for novice teachers. We identify how GenAI reconfigures boundaries between personal and collective knowledge, reshapes enacted practice when AI becomes co-constructor of teaching, and discuss implications for teacher education.

Keywords: Generative Artificial Intelligence; AI literacy; Pedagogical Content Knowledge; Pedagogical Reasoning.

Assessing What Matters in the Age of AI: A Comparative Analysis of Global Competencies in Final-Year Computing Exams in Australia and the United Kingdom

Jackson Clayton, Therese Keane, and Milorad Cerovac

As artificial intelligence reshapes computing work, professional practice increasingly requires graduates to combine technical expertise with critical judgement, creative problem-solving, communication and collaboration in complex, team-based contexts. This raises questions about whether senior secondary computing examinations recognise the broader competencies students may require beyond technical knowledge alone. This study uses qualitative document analysis to examine how final-year computing examinations across selected Australian and United Kingdom jurisdictions assessed the 4Cs—communication, critical thinking, creativity and collaboration—between 2022 and 2024. Across 21 examination papers and associated marking materials, communication and critical thinking were frequently present, but were generally assessed through technical explanation, procedural correctness and bounded forms of applied reasoning. Creativity was assessed less often and was typically constrained to refinement or application within predefined solution pathways, while collaboration was almost entirely absent. The analysis identifies a recurring pattern of surface authenticity, where realistic computing scenarios gesture towards professional practice but ultimately reward narrow or standardised responses. These findings suggest that examination-based assessment only partially recognises the competencies that are desired in contemporary computing practice. The paper contributes to assessment reform debates by highlighting the ways in which current examination structures support, constrain, or marginalise global competency assessment.

Keywords: Global Competencies; 4Cs; Computing Education; High-Stakes Examinations; Assessment Reform; Artificial Intelligence.

Toward Adaptive Mathematics Learning Environments: Insights from a Systematic Review of Game-Based Learning and Social Robots

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Cherry Cigdem Demir, Therese Keane, and Milorad Cerovac

Game-based learning (GBL) and social robots offer increasingly interactive approaches to mathematics education, yet their pedagogical contribution remains unevenly understood. While GBL has been widely investigated for supporting mathematical learning and engagement, research integrating socially interactive and AI-enabled robots remains comparatively limited. This systematic review examines how GBL and social-robot-supported interventions contribute to mathematical learning, motivation, engagement and persistence, while also considering teacher perspectives and comparisons with conventional instruction. Following PRISMA guidelines, the review synthesises empirical research spanning digital and non-digital GBL, humanoid and social robot interventions, and emerging adaptive AI-enabled approaches. Findings indicate that GBL is consistently associated with improvements in mathematical understanding, fluency and learner engagement, while social robots show particular potential for supporting participation, motivation and socially mediated learning. However, most robot-based interventions remain scripted or only partially adaptive, limiting personalised feedback and responsiveness to learner needs. Teachers identify opportunities for differentiation and engagement but also report challenges involving technical reliability, curriculum alignment, cost and professional preparation. The review highlights a continuing gap between the pedagogical potential of socially interactive, adaptive robots and their current implementation in mathematics classrooms, identifying the need for longer-term, theoretically informed and classroom-based research.

Keywords: Game-Based Learning; Social Robots; Artificial Intelligence; Mathematics Education; Primary Education.

14:15 – 16:00

TRACK D: TANGIBLE CODING, GAME-BASED & PRIMARY CS (MHELEMBE ROOM) | Chair:
Lizette Weilbach

Coding Without Computers: A Thematic Analysis of Teacher Attitudes Before and After a Tangible Coding Workshop Using the Rangers Game

Jean Greyling, Andre P. Calitz and Margaret Cullen

Teaching people of all ages about coding has become a critical component of modern education, as it equips children and teachers with critical thinking and problem-solving skills. Tangible is an organisation that teaches coding without computers and has trained over 20000 teachers in one-day workshops. In the coding workshops, participants play a game called Rangers that uses tokens and mobile phones to teach coding concepts. This study examines the attitudes and experiences of teachers from Cape Town, before and after attending a coding workshop using the Tangible coding game, Rangers. A mixed-method approach was used, and the open-ended questions were thematically analysed. The findings reveal a significant shift in attitudes and emotions, from fear to motivation and a sense of achievement and new possibilities. The study contributes to a growing body of knowledge on gamification and teaching coding concepts without computers.

Keywords: Coding Without Computers; Teachers; Thoughts And Emotions; Tangible; Rangers Game.

Comparing South African primary school teachers' tangible coding teaching practices across different socio-economic contexts

Sumaiya Ismail and Machdel Matthee

This paper reports on a qualitative, multi-case study involving nine primary schools across different socio-economic contexts in South Africa. These schools use games from Tangible Africa (TA), an NGO, to teach tangible coding to learners. The study focuses on understanding differences in tangible coding teaching practices across these schools. The findings point to a correlation between the school's socio-economic status (quantiles) and the diversity of teaching practices, despite the schools receiving the same resources from TA. Teachers from low-resourced schools tend to focus on direct instruction, whereas teachers from more affluent schools also integrate constructive practices (such as inter-school competitions). The context of the schools is further considered to explain this observation. It shows that low-resourced schools, typically rural schools, lack

support structures, such as membership in a larger inter-school community. The shared knowledge and practices appear to be valuable for informing practice. Also, through these communities, inter-school competitions and participation in coding tournaments are encouraged. This influences teachers' motivation and practices.

Keywords: Tangible Coding; Socio-Economic Contexts; Primary School Teachers; Teaching Practices.

What Makes a Context Work? Teachers' Perspectives on Everyday-Life References for Computer Science-related Learning in Primary Schools

Felix Ziemann and Torsten Brinda

As digital technologies increasingly shape children's everyday lives, primary education is expected to introduce basic CS-related ideas from an early stage. In various countries, including parts of Germany, such competencies are not taught as a separate subject, but are incorporated into interdisciplinary subjects such as *Primary Social and Science Education*. Taking this subject as an example, this article draws on primary school teachers' perspectives to examine characteristics of and teachers' approaches to suitable contexts for connecting basic CS-related concepts with children's everyday lives and other social and scientific topics. Semi-structured expert interviews were conducted with primary school teachers from North Rhine-Westphalia, Germany, and analysed using a thematic qualitative content analysis. The findings indicate that although teachers have detailed ideas about meaningful everyday-life references, their choices are often influenced by situational and pragmatic aspects, including available resources and their own knowledge and interests. These insights can inform the development of CS-related teaching materials for interdisciplinary primary education. Future work will focus on evaluating and refining them through classroom observations, teacher feedback, and children's perspectives.

Keywords: Primary CS Education; Primary School; Interdisciplinary Subject; CBL; Teaching Material; Teachers' Perspectives.

Parents as Mediating Actors in Primary Computer Science Education: A Systematic Literature Review

Whitney Hachenberg and Torsten Brinda

Computer science education (CSE) is increasingly recognised as part of primary education, yet parents' roles in children's early computer science learning remain underexplored. This systematic literature review examines how parents have been studied as actors in primary CSE, focusing on parent conceptions, attitudes and concerns, self-efficacy, participation, and heterogeneity-related factors. Searches in Scopus, Web of Science, and FIS Fachportal Pädagogik (a German database), together with snowballing from two relevant review sources, identified eleven relevant studies. The findings show that parents often view computer science (CS) topics positively and consider these topics useful for children's learning and future opportunities. However, positive attitudes do not necessarily lead to confidence or sustained involvement. Hands-on parent-child workshops can improve parents' understanding, confidence, and willingness to support children's computing learning, while also helping parents take on roles as collaborators, learners, or teachers. At the same time, long-term engagement beyond short-term interventions remains uncertain. Heterogeneity, equity, and access are addressed inconsistently, although these factors can shape participation patterns. More research is needed, particularly on sustained and heterogeneity-sensitive parental involvement in the German context.

Keywords: Computer Science Education; Primary Education; Parent Participation; Literature Review.

Media Literacy Education Using Card Games and Its Potential

Atsushi Hikita and Yumiko Ogata

This study examines the educational effectiveness of 'LiteLacco', a card game designed for media literacy education focusing on online risks, such as those associated with social media. Our aim in using this game is not to lead players to a single correct answer, but rather to foster a sustained awareness of risks by utilising 'cognitive dissonance' to generate a sense of intellectual unease ('a feeling of uncertainty'). To analyse ways of improving this learning process, two controlled experiments were conducted with primary school pupils. Experiment 1 revealed that adding specific, community-based scenarios to the incident cards significantly increased the pupils' awareness that internet-related issues could personally affect them. Experiment 2 demonstrated that this effect was further enhanced when teachers provided guidance and support during gameplay. These findings suggest that, rather than providing abstract instruction, it is important to apply risks to specific situations and, with the facilitation of educators, skilfully transform information risks into issues that are personally relevant to learners.

Conference day 2: Tuesday 20 October 2026

10:30 – 12:00

TRACK A: GENAI IN HIGHER EDUCATION (INGWE ROOM) | Chair: Christophe Reffay

The Buck Stops Here: A Human-in-the-Loop Blueprint for Teaching AI-Augmented Research in South Africa

Brenda Scholtz and Lynn Fitcher

Educators of Masters' and PhD programmes must balance the productivity benefits of GenAI with its associated risks. In South Africa, infrastructure constraints further complicate this, widening the digital divide. A key outcome of research education is the development of ethical, high-integrity research practices, which requires governance. A central challenge is the policy vacuum and the lack of clarity regarding the teaching of AI-augmented research. This study reports on a systematic literature review and thematic synthesis of existing policies, frameworks, and principles relevant to teaching research in South Africa. A Human-in-the-Loop Blueprint for Teaching AI-augmented Research is proposed. The blueprint highlights the lack of moral agency in GenAI and the need for accountability to remain with humans (educators, students and institutional stakeholders). It includes a layered taxonomy of relevant policies and guiding principles for educators. The study contributes to improved governance of ethical GenAI integration and the quality of research outputs in higher education.

Keywords: Artificial Intelligence; AI-Augmented Research; AI Governance; Human-In-The-Loop; Teaching Research; Cognitive Debt; Transparency; Accountability.

The role of generative artificial intelligence in learning computer programming: students' perceptions and reflections

Janet Liebenberg and Marietjie Havenga

The rapid adoption of generative artificial intelligence (GenAI) in higher education has transformed the way students approach programming tasks, yet limited research has explored how novice programmers perceive the role of GenAI in their learning. Understanding these perceptions is essential for informing the pedagogically sound integration of GenAI into introductory programming education. This study explored first-year students' perceptions of the use of GenAI in learning computer programming following a practical programming assignment completed with any GenAI tool of their choice as support. A basic qualitative research design was employed as part of a larger mixed-methods study. First-year students enrolled in an introductory programming module completed written narratives reflecting on their perceptions regarding the use of GenAI, and the responses from 308 participants were analysed using reflexive thematic analysis. The findings revealed that students predominantly perceive GenAI as a learning partner that enhances conceptual understanding, provides personalised explanations, assists with debugging, supports problem-solving, generates code examples, and promotes skill development. Participants consistently emphasised that GenAI should be used to support learning rather than replace independent thinking and programming practice. Students viewed responsible use as essential to preserving the development of problem-solving skills and programming competence. The study contributes to the growing body of knowledge on AI-assisted programming education by demonstrating that novice programmers recognise both the educational benefits and the limitations of GenAI. The findings suggest that programming curricula should explicitly incorporate guidance on the responsible and pedagogically appropriate use of GenAI to maximise learning while fostering independent computational thinking.

Keywords: Computer Programming; Introductory Programming Students; Generative Artificial Intelligence; Reflections; Self-directed Learning.

An Ethnographic Study of a First-Year Information Systems Module in the Age of Generative AI

Malcolm Garbutt and Carolien van den Berg

This paper argues that the spiral curriculum, as conceptualised by Bruner, offers a powerful pedagogical framework for realising the vision of "connected learning" articulated in the IFIP TC3 WCCE 2026 conference theme, *Learnnected: Empowering Education in a Connected World*. Drawing on agential realism and its application in Information Systems research, we present and discuss an ethnographic study integrating Generative AI as a "field device" to examine how first-year information systems students experience spiral curriculum structures in an era of pervasive AI. We argue that the spiral curriculum — by revisiting foundational IS concepts (Problem, Algorithm, Data, System) across three turns of increasing complexity — operationalises the principles of connected learning: bridging formal and informal knowledge, anchoring learning in authentic social contexts, and building the cognitive structures that enable genuine transferable skills. The paper addresses a central paradox: educators seek to limit student reliance on AI while simultaneously preparing students for an AI-mediated world. Student reflection data from a class of first-year students, both individually and in groups, reveal the pedagogical power of the spiral and a "culture of concealment" around AI use that undermines genuine learning. We propose that spiral curriculum design, grounded in Brunerian scaffolding theory and enriched by transparent AI integration, offers a principled response to this paradox—and we invite educators to undertake similar ethnographic inquiry in their own contexts.

Keywords: Spiral Curriculum; Connected Learning; Ethnography; Generative AI; Agential Realism; Scaffolding.

Walking the Scene: Embodied Forensic Investigation Through Augmented Reality in a Narrative-Driven Platform

Jarred Orfao and Wai Sze Leung

Simulating physical crime scenes in digital forensics education can be constrained by the cost and inconsistency of physical props, making it challenging to sufficiently replicate the perceptual complexity of a real investigative environment. This paper describes the implementation and observational pilot of an augmented reality (AR) crime scene environment integrated into a narrative-driven, web-based digital forensics learning platform. Unlike earlier location-triggered media overlays, the current implementation delivers spatially persistent, explorable rooms that students navigate on their mobile devices. Evidence is embedded within the environment alongside contextual objects, requiring students to exercise investigative discernment rather than simply retrieve visible targets. Computer forensics students participated in a pilot session in which they moved freely through a large physical space investigating an AR scene situated within an ongoing narrative case. Observed behaviours were consistent with embodied investigation: students physically repositioned themselves to examine artefacts from multiple angles, communicated spatial findings with peers, and drew on narrative context established earlier in the platform to interpret what they encountered. Grounded in situated learning theory and embodied cognition literature, this paper argues that spatially persistent AR environments offer a resource-conscious and pedagogically credible alternative to fully prop-based crime scene simulation in digital forensics education. Limitations of the observational design are acknowledged and directions for future structured evaluation are proposed.

Keywords: Augmented Reality; Digital Forensics Education; Embodied Learning; Situated Learning; Narrative-Driven Learning; Crime Scene Simulation.

When AI becomes a Teammate: Negotiating the Role of Generative AI in Student Teams

Lizette Weilbach and Adriana A Steyn

Generative Artificial Intelligence (GenAI) is no longer used by students only to improve their writing or search for information. It is increasingly becoming part of how they plan, discuss, and complete collaborative learning activities. This raises an interesting question: *How do students perceive GenAI when it is introduced as a member of the team rather than simply as another learning tool?* This study explored how students negotiated the role of GenAI as a "sixth team member" during a semester-long group project in a third-year Informatics module at a South African university. This study adopted an interpretive qualitative research approach. Data were collected through a structured Google Form completed by 380 students. The qualitative responses were analysed using Braun and Clarke's reflexive thematic analysis, while Engeström's Activity Theory provided the interpretive lens for understanding the findings. The analysis identified five themes. Most students did not regard GenAI as another member of the team. They used it to help organise their work, develop ideas, communicate more

effectively, and work through decisions, but they still felt that responsibility for the outcome should remain with the team. Many also explained that AI-generated information had to be checked before it could be trusted and included in their work. The study contributes to research on Human-AI collaboration by showing that students actively negotiated GenAI's role within collaborative learning. The findings offer practical insights for educators designing collaborative learning activities that make meaningful use of GenAI.

Keywords: Generative Artificial Intelligence (GenAI); Human-AI Collaboration; AI as a Teammate; Collaborative Learning; Activity Theory (AT); Higher Education.

10:30 – 12:00

TRACK B: EDUCATIONAL MANAGEMENT, SUPERVISIONS & SCALING (MHELEMBE ROOM) | Chair: Lizette Weilbach

An Investigation into 3rd Year and Honours Projects Supervision Management Practices in South Africa

Andre Calitz and Margaret Cullen

The capstone 3rd-year and 4th-year (Honours) software development projects are unique opportunities for Computer Science, Information Systems, and Information Technology students to work individually or in groups to develop innovative real-world software solutions. The ACM 2023 Computer Science Curriculum requires a one-year capstone project in which students are exposed to teamwork, system design, software implementation, and testing. Students must demonstrate integrated competencies, professional communication skills, and real-world problem-solving. 3rd-year and honours software development projects are common practices at S.A. universities. The supervision practices for these projects include individual or group supervision; however, they present various challenges. This study aimed to investigate the practices and challenges of 3rd-year and Honours project supervision at Higher Education Institutions (HEIs) in South Africa. A survey on project supervision practices was conducted among project supervisors at HEIs, and 18 departments participated in the study. The findings indicate that project management practices differ widely among HEIs and that large student numbers, rapidly changing IT technologies, and generative AI tools affect 3rd-year and honours project supervision practices.

Keywords: Computer Science 3rd-Year Projects; Student Project Supervision Practices.

The transitioning of third year Information Technology students to an honours programme and beyond

Rudi Serfontein, Henri van Rensburg, J. Heystek Grobler, Lynette Drevin and Gunther Drevin

This paper considers the transition of third-year Information Technology (IT) students into a postgraduate Honours programme at a South-African University and beyond when going into industry after completing their degree. The study explores the efficacy of a selection examination and a two-week pre-academic induction programme. These tools aim to verify technical readiness, foster collaboration, and address the gap between undergraduate education and industry expectations. Using a two-phase survey approach with the 2026 Honours cohort, the research evaluates student experiences, expectations, and the impact of the programme on graduate attributes. Findings indicate that the selection exam is perceived as a fair second chance for students to prove their worth beyond undergraduate marks. The induction programme, featuring hands-on activities like Lego-Robotics, rotational projects and hackathons, successfully enhanced soft skills such as communication and conflict resolution. While some self-reported attributes like time management saw a perceived decrease, suggesting the programme helped students correct initial overestimations. Most participants felt the induction effectively bridged the academic gap. The study concludes that, project-based interventions are needed for preparing students for the increased workload and professional standards of postgraduate study.

Keywords: Induction Programme; Transition; IT Students; Honours Programme; Work-Readiness; Graduate Attributes; Soft Skills; Lego-Robotics.

Scaling Laboratory-Based Teaching to Large Venues Without Computers: Efficiency and Impact on Student Performance

Nita Mennega, Hanlie Smuts and Michael Bouwer

The expansion of student cohorts in higher education has heightened the demand for teaching methods that are scalable and educationally effective. Although laboratory-based instruction provides valuable hands-on learning experiences, it often becomes resource-intensive when accommodating large student populations. This case study describes the adaptation of a previously small-group, computer-laboratory-based module (40–60 students per session) to a large-venue format accommodating 600 students per session. The change was driven by the need to improve efficiency in managing an annual cohort of approximately 800 students. The new approach significantly reduced the number of lecturers required, optimized time usage, and offered a more financially sustainable teaching model for the university. It was found that the removal of dedicated computer labs slightly negatively influenced students' final assessment marks. Student engagement was identified as the differentiating factor, since the course material remained consistent with previous years. However, the pass rate remained consistent over the new implementation, challenging the assumption that computer-lab environments are essential for certain modules, highlighting that large-venue, non-lab teaching can be effective while delivering substantial cost and logistical benefits.

Keywords: Large Class Teaching; Bring Your Own Device; Student Engagement.

Deterministic Risk Scoring for Connected Early Intervention: An Equity-Driven, Multi-Domain Approach to First-Year Engineering Student Retention in South Africa

Athenkosi Nzala, Unathi September, Malibongwe Manono

First-year attrition in South African engineering faculties is, at its core, a problem of equity and access: the students most likely to leave are disproportionately those from quintile 1–3 schools, first-generation entrants, and the financially vulnerable, the very learners whom widening-participation policy seeks to retain. This paper presents an analytics-driven early intervention system that builds a connected learning network around each at-risk student, using a deterministic, rule-based scoring algorithm to compute a transparent risk assessment across eight domains of student life: financial vulnerability, academic preparedness, mental and emotional wellbeing, social integration, resilience and coping, family background, entrepreneurial mindset, and external circumstances. The composite score routes each student into coordinated, domain-specific support, coached study groups, peer networks, and specialist referrals mediated by a shared vocabulary across a multi-disciplinary support team. In an age in which AI-driven personalisation risks creating opaque 'filter bubbles' and the illusion of connected support, we argue that transparency and decomposability are precisely what make learning analytics genuinely empowering and equitable: unlike probabilistic machine-learning models, the deterministic approach ensures full transparency, auditability, and reproducibility of every risk classification, so that the learners being classified, and the staff supporting them, can see exactly why a flag was raised and what to do about it. We report on a deployment with 820 first-year engineering students at the University of Cape Town across two consecutive cohorts (2025, $n = 418$; 2026, $n = 402$). The system achieved 92% accuracy in identifying at-risk students, contributing to a 23% improvement in first-year retention and a 76% increase in student readiness scores in the 2026 intervention cohort. Risk stratification revealed that 59% of students fell into the medium-risk category (scoring 31–60 on a 100-point scale), underlining the importance of connected, domain-specific intervention over single-indicator triage. With a conservative first-year return on investment of 3:1, we argue that connected, multi-domain early intervention is both educationally sound and financially necessary to widen participation across socio-economic backgrounds.

Keywords: Equity and Access; Early Warning Systems; Student Retention; Explainable Learning Analytics; Design Science Research.

14:00 – 15:00

DIGITAL TO AI LITERACY AND FUTURE CAPABILITIES, CURRICULUM, ASSESSMENT:
SOUTH AFRICA (INGWE ROOM) | Chair: Riana Steyn

Exploring Technostress in the Era of Generative Artificial Intelligence

Vusumzi Funda

The rapid adoption of Generative Artificial Intelligence (GenAI) in higher education presents both opportunities and challenges, particularly in relation to technostress among university lecturers. This study investigates the relationship between GenAI adoption and technostress within South African higher education institutions. A qualitative phenomenological design was adopted, with data collected through semi-structured interviews from 15 university lecturers with experience in GenAI integration. Data was analysed using thematic analysis supported by NVivo software. The findings reveal two overarching themes: (1) Drivers of technostress in GenAI adoption, including cognitive overload, rapid technological change, and ethical uncertainty; and (2) Institutional support mechanisms, highlighting gaps in training, policy ambiguity, and the importance of peer collaboration. While GenAI enhances efficiency and pedagogical innovation, it simultaneously increases workload, blurs work-life boundaries and raises concerns regarding academic integrity. The study concludes that technostress in the GenAI era is a multidimensional phenomenon shaped by the interaction between individual capabilities and institutional readiness. It recommends structured professional development, clear institutional policies, and contextually relevant support systems to ensure sustainable AI integration in South African higher education.

Keywords: Generative Artificial Intelligence; Technostress; Higher Education; University Lecturers; Workload and Well-being; South Africa.

Integrating an AI-powered Chatbot in Informal Digital Learning of English Pronunciation: A Participatory Study with Primary School Students

Mengqi Fang

AI chatbots offer new avenues for Informal Digital Learning of English (IDLE) pronunciation, yet their pedagogical value and effective integration among young EFL learners remain underexplored. This mixed-methods study explored Chinese primary school students' experiences and perceptions of using an AI chatbot to practise pronunciation in out-of-classroom contexts. Six students, aged 6 to 8, participated as co-researchers, using an AI chatbot for extramural and extracurricular activities over four weeks. Data were collected through pre- and post-tests, system-generated learning metrics, and a focus group, supplemented by parental observations (n = 6). Descriptive analysis of the quantitative data revealed individual differences in learning time and pronunciation progress, despite learners generally spending more time on extramural activities. Thematic analysis corroborated these findings, indicating positive perceptions of interactive learning environments, visual and embodied cues, opportunities for self-directed learning, and perceived improvements in oral expression and speaking confidence. However, several obstacles to IDLE practices, including the chatbot's limited conversational capabilities, learners' low AI literacy and English proficiency, were reported, although participants and their parents' emphasis on these issues varied. Interpreting the findings through social constructivism and the Interaction Hypothesis, the study highlights the pedagogical potential of AI chatbots in raising learners' awareness of pronunciation errors and other linguistic features, as well as inspiring learner interest in speaking English. Implications of the findings, including incorporating appropriate human support and maintaining young learners' agency and autonomy, are discussed. The study contributes to the understanding of chatbot potentials in developing pronunciation and the ongoing discourse on the use of AI chatbots in IDLE. Rather than positioning AI as a replacement for human interaction, the findings suggest that chatbots can serve as valuable supplementary tools and conversational partners through which learners explore, negotiate, and receive immediate feedback in informal learning contexts. The study also provides insights into connected learning in the age of AI and highlights the need to consider not only technological access but also the developmental, psychological and pedagogical conditions that enable meaningful participation in connected learning.

Keywords: Chatbots; Informal Digital Learning Of English; Pronunciation; Primary School; Participatory Study.

Teaching energy transition in Macaronesia with system dynamics and environmental learning computer simulation

Javier Osorio

This presentation describes a novel teaching experience that applies system dynamics for energy behaviour and environmental learning to university and high-school students in the Macaronesia cooperation area. The educational objective is to train learners to design and test innovative technological solutions, methodologies, and strategies that increase renewable energy integration and support the decarbonisation of tourism industry-dependent island and coastal economies.

Keywords: Environmental Learning; Decarbonisation; System Dynamics; Renewable Energy Integration; Macaronesia.

15:00 – 16:45

TRACK C: INFORMATION SYSTEMS & CYBERSECURITY EDUCATION (INGWE ROOM) |

Chair: Lynette Drevin

From Learner to Educator: Student Experiences of Peer-Teaching in an Honours Computer Security Module

Michael de Jager and Lynette Drevin

Cybersecurity education requires students to develop not only technical knowledge but also the analytical reasoning, communication, and problem-solving skills demanded by professional practice. While peer-teaching has demonstrated educational benefits across several computing disciplines, its implementation within honours-level cybersecurity education remains underexplored. This study investigates student experiences of a semester-long peer-teaching strategy implemented within an honours Computer Security module at a South African university. A mixed-methods implementation case study was conducted involving honours students across two campuses. Quantitative data were collected using an end-of-semester questionnaire and analysed using descriptive statistics, while qualitative responses were analysed. Four themes emerged from the qualitative analysis: peerification of complex Computer Security concepts, increased engagement and ownership of learning, development of professional competencies, and the importance of lecturer validation. The findings demonstrate that peer-teaching represents a valuable pedagogical approach for honours cybersecurity education. By requiring students to explain, justify, question, and apply complex Computer Security concepts, the strategy promoted learning experiences that closely reflected professional cybersecurity practice while maintaining academic rigour through continued lecturer guidance. These findings provide practical insights for educators seeking to strengthen active learning within advanced cybersecurity programmes.

Keywords: Computer Security Education; Active Learning, Peer Teaching; Professional Skills Development; Honours module.

The Participation-Centered Learning Model (PCLM): A Conceptual Model for Undergraduate Information Security Education

Michael de Jager

Presentation-based learning is widely used in undergraduate Information Security education to develop students' technical knowledge, communication skills, and professional competencies. However, while presenting students typically engage deeply with the learning process, audience participation often remains limited, reducing opportunities for collaborative learning and sustained classroom engagement. Existing pedagogical approaches provide valuable strategies for active learning and participation but offer limited guidance on how meaningful participation can be intentionally designed, reinforced, and sustained throughout repeated presentation activities. This paper proposes the Participation-Centered Learning Model (PCLM), a theoretically grounded conceptual model that transforms presentation-based learning into a collaborative learning environment by positioning presenters, audience members, and the lecturer as active participants in the knowledge construction process. Drawing upon constructivism, social constructivism, active learning, Self-Determination Theory, and reflective learning, the model integrates preparation, presentation, engagement, lecturer facilitation, participation recognition, and reflection into a unified pedagogical model. Central to the

model is a Participation Reinforcement Mechanism (PRM) that continuously recognises meaningful classroom participation across the semester, encouraging sustained engagement rather than isolated participation during individual presentations. The paper presents the conceptual architecture of PCLM and demonstrates its implementation within an undergraduate Information Security module at a South African university. Future research will empirically evaluate the effectiveness of the proposed model in enhancing student participation, engagement, and collaborative learning.

Keywords: Information Security Education; Active Learning; Peer Teaching; Professional Skills Development.

Reflections from Integrating Cybersecurity Awareness in a Higher Education Institution: A Case Study of a South African University

Lynn Fitcher and Kerry-Lynn Thomson

In an era where cyberattacks increasingly threaten the integrity, continuity and reputation of higher education institutions, cybersecurity can no longer be viewed solely as a technical concern confined to information technology service departments. Rather, it has emerged as a critical institutional responsibility that requires the collective awareness, knowledge and participation of all stakeholders. This paper reflects on the integration of cybersecurity awareness within a South African higher education institution, including the design of a cybersecurity awareness course, stakeholder engagement, key insights, and future directions on embedding cybersecurity awareness across the academic environment. The reflection highlights that developing cybersecurity competence among Faculty staff and students is a strategic mechanism for fostering a sustainable cybersecurity culture in which secure behaviours, risk awareness, and shared responsibility become embedded in the values and everyday practices of the University community. In the South African context, where digital transformation is accelerating amidst significant socio-economic and cybersecurity challenges, cultivating such a culture is essential for enhancing institutional resilience and safeguarding the future of higher education.

Keywords: Cybersecurity Awareness; Cybersecurity Culture; Higher Education; Reflective Practice; Autoethnography.

Beyond Access. Learner Cyber-Safety Readiness for Connected Learning

Godwin Mandinyenya, Caroline Magunje, Wallace Chigona and Laban Bagui

Digital equity in education is often assessed through access to devices, internet connectivity and digital learning platforms. Safe participation also requires learners to recognise and manage online risks. This descriptive cross-sectional study examined patterns in connected-learning access, cyber-safety awareness and protection among 310 learners in Grades 6–11 attending six marginalised rural and high-density urban schools in the Western Cape and Limpopo provinces of South Africa. Thirty common questionnaire items were analysed using frequencies and percentages. School internet access was reported by 71.9% of learners, WhatsApp communication with classmates by 66.1%, and teacher technology use by 65.8%. Although 70.6% reported awareness of internet risks, only 38.7% reported formal cyber-safety training. Further indicators included password sharing (30.6%), limited caution with links and downloads (45.2%), use of social-media privacy settings (46.8%), and cyberbullying experience (41.3%). These self-reported results show an uneven descriptive pattern across access, awareness and protection; they do not establish causal relationships. The paper develops a literature-informed access–awareness–protection framework for organising these indicators and argues that connected-learning initiatives should include practical cyber-safety education and visible school support.

Keywords: Digital equity; Connected Learning; Cyber-safety Readiness; Online Safety; Cybersecurity Awareness; Rural Schools; Learners.

Cybersecurity Challenges and Maturity Considerations for Online and Hybrid Higher Education: A Scoping Review and Socio-Technical Mapping

Nuraan Davids-Latief, Louis Fourie and José Frantz

Digital transformation and the expansion of online and hybrid learning have increased the cybersecurity exposure of higher education institutions (HEIs). This scoping review identifies cybersecurity barriers, threats, vulnerabilities, enablers, structural gaps and consequences relevant to online and hybrid education in HEIs and considers their implications for cybersecurity maturity assessment. Following Arksey and O'Malley's (2005) scoping review approach and PRISMA-ScR reporting principles, searches were conducted across fourteen electronic academic databases for English-language publications from 2018 to 2023. After removing duplicates and a three-stage screening conducted by two reviewers, 30 studies were included. Thematic synthesis identified 45 cybersecurity-related concerns grouped into ten themes. The findings show that cybersecurity in

higher education (HE) is not only a technical problem but a socio-technical maturity challenge shaped by people, processes, governance, infrastructure and external regulatory pressures. Mapping the themes against NIST CSF 2.0 and ISO/IEC 27001:2022 indicates broad alignment with established standards but also highlights HEI-specific complexities that generic frameworks may not adequately operationalise. The review provides an evidence base for developing contextualised cybersecurity maturity assessment approaches for online and hybrid learning in HEIs.

Keywords: Cybersecurity; Higher Education; Maturity assessment; Online education; Hybrid learning.

15:00 – 16:45

TRACK D: ENGINEERING, VOCATIONAL & IMMERSIVE TECH (MHELEMBE ROOM) | Chair: Christophe Reffay

The application of AI technologies as connected learning enablers in industrial engineering education

Jacoba H. Bührmann and Maria van Zyl-Cillié

Industrial engineers are uniquely positioned to integrate human-centred values in intelligent production and service system solutions within the Industry 5.0 era, driven by sustainability and human well-being. The use of a connected learning paradigm is well-suited to the education of engineers, allowing for interactive and flexible engagements to experience real-world challenges. However, identifying how generative AI can enhance educational outcomes, specifically within the connected learning context, has become a topic of great interest to many educators. This research describes how three generative AI applications were deployed as connected learning enablers in the curriculum and assessments of two final-year industrial engineering modules at a higher education institution in South Africa. These applications included an AI tutor bot, a scenario-based AI agent and the unrestricted use of generative AI in a machine learning coding assignment. The three applications were placed within Bloom's taxonomy framework. They were furthermore aligned within Kolb's cycle of experiential learning to motivate the implementation of AI technologies at the appropriate level, ensuring student outcomes are achieved at the correct level. Our findings were based on the introduction of these approaches and their potential to prepare students for the challenges they will face in the Industry 5.0 era. The research demonstrated the successful application of AI technologies to enhance experiential learning in the three provided examples within the industrial engineering context.

Keywords: Engineering Education; Experiential Learning; Generative AI Applications.

Making Thinking Visible in AI-Integrated Tertiary Vocational Education

Bertram Haskins

Generative AI challenges assessment practices that rely heavily on final student artefacts as evidence of learning. This is particularly significant in vocational and practice-oriented AI-integrated education, where students are expected to use AI tools in realistic professional workflows while also demonstrating judgement, accountability and contextual understanding. This paper argues that critical thinking, creativity and ethical reasoning should not be treated as separate additions to technical AI curricula but embedded in the design and assessment of applied tasks. Drawing on literature, the paper proposes a conceptual framework for making student thinking visible. The framework emphasises process evidence, tool critique, embedded ethical reasoning, situated creativity and evaluative judgement. It is intended to support curriculum designers and educators in developing assessment practices that preserve vocational rigour in AI-assisted learning environments.

Keywords: Artificial Intelligence Education; Vocational Education; Curriculum Design; Assessment; Critical Thinking; Ethical Reasoning.

A Prescriptive Framework for Designing Experiential Learning Interventions in Engineering Education in the Age of AI

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Tanya J. Kok, Maria van Zyl-Cillié, and Jacoba H. Bührmann

The rapid integration of artificial intelligence (AI) into higher education is creating new opportunities to enhance experiential learning while challenging educators to design pedagogically effective learning environments. AI- though experiential learning approaches, including serious games, learning factories and business simulations, have been widely adopted within engineering education, limited guidance exists on how these interventions should be systematically designed or how AI should be meaningfully integrated. This paper proposes a prescriptive framework for designing experiential learning interventions to support educators in developing effective experiential learning environments in the age of AI. The framework was developed through a narrative literature review and synthesises six foundational design principles with four increasingly sophisticated experiential learning environments, ranging from experiential exposure to AI-enhanced experiential learning. The framework was subsequently applied analytically to four undergraduate industrial engineering education interventions by mapping their documented designs and implementations against the six foundational design principles and the four experiential learning environments. The findings suggest that effective experiential learning is primarily dependent on sound instructional design rather than technological sophistication. While AI can enhance personalised guidance, adaptive feedback and learner reflection, its educational value remains dependent upon the consistent application of established experiential learning design principles. The proposed framework provides educators with practical guidance for selecting and designing experiential learning interventions that align with intended learning outcomes while positioning AI as an enhancement to, rather than a replacement for, effective pedagogical practice.

Keywords: Experiential Learning; Engineering Education; Artificial Intelligence Enhanced Learning; Learning Design.

Artificial Intelligence as a Facilitator of Vocational Science: A Conceptual Framework for Apprentice Learning

Ann Baxter, Therese Keane and Stefan Schutt

Vocational education and training (VET) is increasingly shaped by Industry 5.0 - the next evolution of human-centric production systems - requiring apprentices to integrate conceptual scientific understanding with workplace practice rather than rely solely on procedural competence. However, vocational science - the applied theoretical knowledge that explains and informs practice - remains underdeveloped and existing artificial intelligence (AI) in education research offers limited guidance for apprenticeship contexts. This conceptual framework paper reconceptualises AI not as a content delivery tool but as a facilitator of vocational science across the formal-informal boundary of apprenticeship learning. Drawing on social realist theory and threshold concept frameworks, and employing a conceptual synthesis of interdisciplinary literature, vocational science is defined as knowledge enabling reasoning and decision-making under non-routine conditions. An original framework is proposed comprising five dimensions of AI facilitation: recontextualising knowledge, adaptive-scaffolding, boundary-spanning, reasoning-support and AI-Human decision-making. The framework positions AI as facilitating the relationship between “knowing-why” and “knowing-how” across cognitive, experiential and workplace layers, supporting the integration of conceptual knowledge with workplace practice without collapsing the distinction between them. This has implications for learning outcomes and workplace transfer. It specifies conditions for effective enactment and highlights that AI must augment - not displace - conceptual understanding in apprentice training.

Keywords: Artificial Intelligence; Vocational Education and Training (VET); Vocational Science; Apprenticeship Learning; Industry 5.0; Workplace Learning.

A Comparison of the Use of GenAI Tools by Computer Science Students, Academics Teaching Programming Modules and IT Professionals in Industry

Ines Oldenburg, Andre P. Calitz, Margaret Cullen and Jorge Marx Gómez

Computer Science (CS) Departments at Higher Education Institutions (HEIs) teach students to programme using computer languages, such as Python, Java and C++. The ACM prescribes curricula for Computer Science (CS2023) and Information Systems (IS2020). Teaching programming and software development in the age of Generative Artificial Intelligence (GenAI) has had a significant impact on HEIs and programme offerings. Software developers in the industry are increasingly using GenAI for coding and in the system development life cycle. The aim of the study was to investigate the GenAI tools used by CS students, academics teaching

programming modules and software developers in the IT industry. Students, academics and software developers working in the IT industry in Germany and South Africa participated in the surveys. The data were statistically and thematically analysed, and the results of the study indicate that students use GenAI tools to assist with coding and across all stages of the software development life cycle in industry. All respondents agreed that the fundamentals of coding and software development must be taught at the undergraduate level, and the use of GenAI tools must be introduced into the curriculum.

Keywords: Software Development; GenAI Tools; IT Industry Practices.

Conference day 3: Wednesday 21 October 2026

09:15 – 10:15

TRACK A: DISTANCE LEARNING, PLATFORMS & FUTURE SKILLS (INGWE ROOM) | Chair: Sharon Singh

Cognitive load, Immersive Technologies, and Inclusion: A synthesis and framework for Open Distance eLearning in Higher Education

Charlotte Lungile Hlengwa

The increasing adoption of immersive technologies such as Virtual Reality (VR) and Augmented Reality (AR) in higher education offers significant pedagogical opportunities but also introduces complex cognitive and accessibility challenges. This paper critically examines the intersection of cognitive load, immersive learning, and inclusive education within Open Distance eLearning (ODEL) environments. Drawing on a targeted synthesis of 20 systematic reviews and empirical studies, the study identifies a persistent fragmentation between research streams on cognitive load theory, extended reality (XR), and disability-inclusive education. In response, the paper proposes an integrative theoretical framework combining the Cognitive Load Theory (CLT), the Cognitive Theory of Multimedia Learning (CTML), Universal Design for Learning (UDL), and XR affordances, further extended through emerging AI-driven adaptive learning approaches. Findings reveal a critical gap in the design of XR-supported inclusive ODEL environments that are both cognitively efficient and accessible to neuro-diverse learners. Current research lacks longitudinal, ecologically valid, and accessibility-centred approaches to cognitive load management in immersive contexts. The study contributes a conceptual model that positions cognitive regulation as the central mechanism linking immersive technologies and inclusive learning outcomes. The paper concludes with recommendations for future research in longitudinal, accessibility-centred, and AI-driven learning design.

Keywords: Cognitive Load; Extended Reality; Virtual Reality; Augmented Reality; Open Distance e-learning; Neurodiversity; Inclusive Education; Universal Design For Learning; Artificial Intelligence In Education.

From Conceptual Model to Implementation: Evaluating Cross-Module Integration in Undergraduate Computing Education

Luke Coetzee, Michael de Jager and Lance Bunt

Undergraduate computing curricula are commonly organised into separate modules, which can limit students' opportunities to experience how technical, security, and communication competencies interact within professional practice. This fragmentation persists even where modules address closely related professional tasks, creating a gap between how computing is taught and how it is practised. Building on the previously proposed Cross-Module Integration Model (CMIM), a conceptual framework for coordinating learning across modules through a shared project artefact, this paper reports on its first practical implementation. Because educational models that appear sound in theory do not always translate effectively into practice, examining this implementation provides important evidence of the model's feasibility and practical value. The study adopts a reflective implementation case study approach, drawing on lecturer observations, planning documentation, assessment records, and student presentations gathered during the deployment of the CMIM across Object-Oriented Programming, Information Security, and Communication Skills modules. The implementation involved 94 students working in 24 groups over a ten-week semester, using a shared software development project as the point of integration across all three modules. The findings demonstrate that the CMIM can be implemented without disrupting individual module learning outcomes or assessment practices, and that the shared artefact functioned effectively as a boundary object linking the three disciplines. Lecturer reflections also identified practical refinements, resulting in an implementation-informed version of the CMIM.

Keywords: Cross-Module Integration; Curriculum Integration; Computing Education; Project-Based Learning; Boundary Object; Reflective Practice; Active Learning; Peer Teaching; Professional Skills Development.

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AI and Human Skills development: Scenario planning of the future of Education 2030

Nicholas Mavengere, Toshinori Saito, Francis Manzira, Moses Moyo, Marie Col-lins, Atsutsi Hikita, Daryl Hepting, Maina Muuro, Amit Pariyar

The paper highlights four plausible future scenario of higher education focusing on human skills development considering environment strongly influenced by AI advancing. The research offers a comprehensive investigation at the intersection of AI advancement, human skill development, and the future of higher education. The use of scenario planning is appropriate because of high uncertainty and dynamic human skills requirements in AI-rich environments. The definition of the human skills considering AI advancement has been noted as a gap in research and practice. Scenario planning was conducted basing on secondary data. This AI-driven transformation of skills and education is a high-priority agenda for governments, HE institutions, and employers. The result of this research includes noting four scenarios namely Smart Together-ness, Intelligent Siloed World, Widely Separated Worlds and Widely Separated Worlds. Smart Togetherness is noted as the most plausible scenario.

Keywords: Generative AI; Human Agency; Higher Education.

09:15 – 11:00

TRACK B: INTELLIGENT SYSTEMS, ASSESSMENT & GRADING (MHELEMBE ROOM) |

Chair: Mary Webb

Automated Grading and Feedback System for Students' Essays

Kristoffer Hagen, Isah A. Lawal, and Shahnila Rahim

Grading essays and providing meaningful feedback remain time-intensive responsibilities for educators, especially in online and large-enrolment learning environments. This paper presents a proof-of-concept automated grading and feedback system that combines a fine-tuned DistilBERT model for essay scoring with a Qwen2.5-3B-Instruct-based feedback generator. The system is designed as a decision-support tool that improves assessment efficiency while preserving the central role of teachers' professional judgement. The study contributes an integrated pipeline linking transformer-based essay scoring with score-conditioned formative feedback, an experimental comparison of scoring configurations, and a web-based prototype for educational use. The scoring model was trained and evaluated using 17,492 tenth-grade essays from four prompts in the ASAP 2.0 dataset. Six experimental configurations examined the effects of feature weighting, numeric feature integration, sliding-window chunking, and increased training data. Essay-level numeric features were combined with mean-pooled DistilBERT text representations, and the final pipeline was evaluated using stratified five-fold cross-validation. The autograder achieved an average Quadratic Weighted Kappa score of 0.8049 with a standard deviation of 0.0050, indicating stable agreement with human-assigned scores. The feedback component was refined through iterative prompt engineering to produce structured, rule-guided responses based on the predicted score, student essay, assignment prompt, source article, role specification, outcome focus, and explicit generation rules. The generated feedback addressed students' strengths, areas for improvement, concrete next steps, and overall performance, and was generally relevant because it was conditioned on both the predicted score and rubric descriptions associated with the ASAP 2.0 scoring scale. The system was implemented as a web application that enables users to submit essays and receive automated grades with formative feedback. Overall, the results suggest that combining a compact transformer-based autograder with an open-source LLM feedback generator can improve assessment efficiency and feedback availability. At the same time, the system should be understood as a pedagogical support tool rather than an autonomous assessment mechanism.

Keywords: Automated Essay Scoring; Feedback Generation; Artificial Intelligence; Educational Technology; DistilBERT.

Evaluation of a Configurable Processor for LLM-Resistant Embedded Systems Assessment

Gerrit Büter, Melvin Ferreira, and Ashraf Sheri

Large language models have fundamentally altered the landscape of programming assessments. While a student submitting AI-generated code for a standard embedded systems assignment can often produce output that is syntactically correct and logically structured, sometimes indistinguishable from genuine work even to detection tools, this capability relies entirely on the availability of the target instruction set in the model's training data. This paper argues that robust resistance must reside in the assessment design itself rather than in post-hoc policies. We present an educational environment utilizing an in-house developed processor with a configurable instruction set architecture (ISA). By configuring an ISA that is not in the public domain, we ensure that the required syntax is absent from the training data of general-purpose LLMs. Consequently, while sophisticated prompting may allow a capable student to collaborate with an AI to learn concepts, the model cannot autonomously generate syntactically valid assembly code for the custom architecture. We evaluate eight well-known large language models on a standard embedded systems assignment across two architectures: one well-known and one based on our processor. The results demonstrate that LLM resistance is architectural rather than policy based. Unlike approaches that increase task complexity, which often obscure fundamental learning objectives for students in core modules, our method maintains the same cognitive load and educational value for the learner while rendering automated generation ineffective. This approach requires no detection tools, oral examinations, or additional marking effort, and can be refreshed between assessments by simply altering the instruction-set configuration.

Keywords: Academic Integrity; Assessment Design; Assembly; LLM-resistant Assessment; FPGA Education; Embedded Systems Education; Generative AI; Computer Architecture.

Comprehensibility over Transparency: How South African Students Evaluate Explanations from an Educational Recommender System

Ayanda Wendy Ndlovu, Unathi September and Walter Ferreira Uys

Explainable AI (XAI) is commonly evaluated by how fully a system discloses its reasoning, yet most evidence comes from the Global North context and assumes that users can readily interpret what is disclosed. Less is known about how users in the Global South understand these explanations. This study investigates how South African students evaluate the quality of explanations from an educational recommender system (ERS). A concurrent mixed-methods design framed by the User-Centric Evaluation Framework (UCEF) incorporated an online survey ($N = 207$) with semi-structured interviews ($n = 13$). Participants were post-secondary students who had used a South African ERS app (BridgeApp) for recommending institutions and qualifications to Grade 12 learners. Most of the participants attended low- to moderate-resource schools (Quintiles 1–3: 77.8%). The survey data were analysed descriptively and through structural modelling and the interviews were analysed thematically. The highest-rated property was comprehensibility, the perceived clarity and ease of understanding of an explanation ($M = 4.46$, $SD = 0.67$; 93.2% positive), ahead of trust and satisfaction (both $M = 4.27$), transparency ($M = 3.99$) and contrastivity ($M = 3.72$). The expected associations between transparency and trust ($\beta = 0.208$) and between trust and satisfaction ($\beta = 0.319$) were reproduced, and the clarity-satisfaction relationship was not moderated by prior familiarity with higher education. Interviews attributed this comprehensibility to linguistic accessibility, specifically plain English, which students linked to schooling in English as an additional language. The findings suggest that the primary design requirement for ERS explanations should be comprehensibility, not mainly disclosure; and that equitable access to AI-mediated guidance in connected learning environments depends on whether learners in multilingual, low-resource settings can understand what an XAI system recommends.

Keywords: Explainable AI; Educational Recommender Systems; Comprehensibility; User-Centred Evaluation; Linguistic Accessibility.

Evaluating the Quality of Assessment Items Generated by Large Language Models for Large-Scale Educational Assessments

Adilson Oliveira Cruz, Isaura Alcina Martins Nobre, Marize Lyra Silva Passos and Mariella Berger

As Large Language Models (LLMs) are increasingly adopted in educational settings, their effectiveness in generating high-stakes assessment items requires rigorous empirical validation. This paper presents an evaluation of the quality of assessment items generated by the LLM ChatGPT based on the perceptions of high school

teachers. A total of 242 assessment items were generated by 13 teachers from 15 different subjects, using One-shot and Prompt Engineering techniques. The items were created to compose a mock exam inspired by the Brazilian National High School Examination (ENEM), the country's main university entrance examination, which was administered to 296 high school students at a federal educational institution. The evaluation considered criteria related to overall quality, clarity and textual coherence, and alignment with the style and difficulty level of ENEM questions. The results indicate that although LLMs are effective at generating grammatically correct and coherent statements, the produced items showed moderate quality and low alignment with the characteristics of large-scale educational assessments, particularly in subjects within the STEM domain. The findings suggest that LLMs can serve as support tools for assessment item generation, but teacher supervision remains necessary to ensure the pedagogical quality of the generated questions.

Keywords: Automatic Item Generation; Large Language Models; Learning Assessment; Large-Scale Educational Assessment.

Bounded Professional Agency and Generative AI: Teachers Navigating High-Stakes Assessment

Cameron Stow, Therese Keane, Alexia Maddox and Craig Deed

Generative artificial intelligence (GenAI) is unsettling established assumptions about authorship, authenticity and evaluation in high-stakes secondary assessment. In the Victorian Certificate of Education (VCE), where school-based assessment contributes to university entrance rankings, teachers must make consequential decisions about acceptable AI use and the authentication of student work, often before formal governance has caught up. This conceptual paper uses a theory synthesis approach to integrate policy enactment theory, professional agency, adaptive expertise and sociotechnical perspectives into the construct of bounded professional agency. The framework characterises teacher judgement in AI-mediated assessment as relational, consequential and asymmetrically risky: it is exercised within institutional and regulatory constraints, carries significant consequences for students, and exposes teachers to uneven professional risk. The paper argues that, under these conditions, teachers function as frontline regulators whose classroom-level decisions effectively set the working rules for GenAI use. A constructed authentication scenario illustrates how the framework can be applied. The paper also establishes the conceptual foundation for a forthcoming doctoral study examining how VCE teachers in Melbourne Archdiocese Catholic Schools exercise professional judgement around GenAI in high-stakes assessment, in which the framework will be tested and refined against teachers' accounts of practice. Implications are identified for assessment policy, professional learning and AI governance in high-stakes education

Keywords: Generative Artificial Intelligence; Bounded Professional Agency; High-Stakes Assessment.

11:15 – 12:00

SHORT PAPER PRESENTATIONS (INGWE ROOM) | Chair: Therese Keane

Chromebooks in Public Secondary Schools in India: A Case Study on Language Classroom Integration

Amina Charania and Sumegh Paltiwale

The National Education Policy 2020 (NEP 2020) mandates digital technology integration for student centred learning in Indian schools. While large-scale, heavily subsidized hardware initiatives have triggered an unprecedented influx of devices into Indian public schools, access to technology has outpaced the pedagogical evolution required to make it meaningful. In emerging economies, executing one to one (1:1) device ratio in school education especially in the marginalized settings in the past has encountered bottlenecks such as erratic power, weak bandwidth, and a lack of systematic teacher professional learning. Referring to the Technological Pedagogical Content Knowledge (TPACK) framework, this paper utilizes a single case study method to explore the integration of Google Chromebooks within an 8th-grade Sanskrit language classroom in an Indian pilot school. Data were drawn from structured classroom observation and followed with a semi-structured interview with the teacher in their Sanskrit (one of the Indian traditional languages) language teaching classroom. The classroom observation and teacher interview revealed that using Chromebooks fostered multidisciplinary by connecting traditional language learning with science and mathematics. Students demonstrated agency through

independent web research and multimedia project creation, while teachers benefited from structural autonomy in curating online resources. While the 1:1 device deployment granted the teacher structural autonomy to adopt digital applications and fostered independent student web research beyond textbooks, it simultaneously highlighted a profound pedagogical misfit. The study also exposed practical bottlenecks, including infrastructure limitations like a lack of projector connectivity and a predominantly teacher-centric instructional style relying on closed-ended questioning. Addressing these challenges through continuous teacher professional development and online communities of practice is vital to help educators move beyond technical limitations toward truly interactive, student-centred digital learning. Further, the study underscores that continuous teacher professional development should not be restricted to learning about the devices and applications deployed in their classroom. Instead, it should empower teachers' TPACK and confidence to use digital technologies that best suit the learning needs of their students. Furthermore, it must ensure sustained technology use while considering classroom and school realities.

Keywords: One-To-One Computing; Chromebooks; Google Workspace for Education; TPACK; ICT in Education Computer-Assisted Language Learning (CALL).

Co-Constructing a Primary Data Literacy Framework: Lessons from Design-Based Research in the DALI4US Project

Deirdre Butler, Janez Demšar, John Hurley, Claude Reuter, Ana Farič, Aoife Flanagan, Anthony Kilcoyne, Borut Čampelj, Blaž Zupan

Data literacy is becoming a foundational educational capability as children increasingly encounter data-driven and artificial intelligence (AI)-mediated systems in everyday life. Yet primary education lacks age-appropriate, classroom-feasible frameworks that enable learners to understand how data are generated, organised, explored, interpreted, and used to inform recommendations or decisions. This paper reports the co-construction of the DALI4US data literacy framework for learners aged 10–12 through a two-year design-based research process involving teachers and project partners in Ireland, Luxembourg, and Slovenia. Grounded in an exploratory conception of data literacy that foregrounds curiosity, visualisation, pattern-seeking, interpretation, and communication, the study used iterative cycles of needs analysis, workshop design, enactment, teacher feedback, reflection, and redesign. Evidence was drawn from workshop discussions, surveys, focus groups, and classroom implementation of data literacy activities, with teachers participating as co-design partners. Early findings challenged the assumption that teachers could directly adapt professional data science and machine learning tools for primary classrooms. Although an introductory workshop using Orange Data Mining enhanced conceptual awareness, it did not provide the pedagogical clarity, curricular alignment, or practitioner confidence required for classroom implementation. Subsequent workshops therefore prioritised simplified, structured, and predominantly unplugged activities. Their design and disciplinary focus also proved critical. A leaf-clustering task indicated that open-ended domains and insufficiently specified analytical procedures could obscure intended learning outcomes. By contrast, a recommender-system activity grounded in familiar media highlighted the pedagogical value of bounded contexts, learner-generated data, and readily interpretable patterns. A fictional gnome-classification task further demonstrated how explicit attributes, yes-or-no questions, and a constrained problem space could make classification and decision-tree reasoning visible without programming. Across the cycles, feasibility improved when activities began with meaningful contexts, focused on one core concept, linked explicitly to the curriculum, and used digital tools to extend prior conceptual understanding. The findings indicate that professional data science tools are not readily transferable to primary classrooms. Effective data literacy education should therefore prioritise conceptual understanding, learner agency, teacher confidence, and classroom feasibility. Digital tools should be introduced selectively to extend learning developed through unplugged activities without adding unnecessary complexity. These findings informed the DALI4US framework, which conceptualises primary data literacy as a flexible, cyclical process comprising five connected stages: Trigger, Collect, Organise, Explore, and Share. Learners respond to a meaningful stimulus by generating or gathering data, organising them to reveal patterns, exploring relationships through comparison, classification, recommendation, or modelling, and communicating interpretations that acknowledge uncertainty. Rather than forming a rigid sequence, these stages may be repeated, combined, condensed, or distributed across lessons. The paper contributes an inquiry-oriented model for integrating data literacy and introductory AI concepts into upper-primary curricula, design principles for developing classroom-ready learning scenarios, and methodological insights into the value of design-based research for curriculum innovation in emerging domains. Future research should evaluate framework-aligned learning scenarios, professional learning resources, and the use of appropriate digital tools that extend and develop data literacy across diverse classroom contexts.

Designing Collaborative Introductory Informatics for Non-STEM Students in the Age of AI

Takeshi Watanabe and Seiichi Tani

In the age of AI, introductory informatics for non-STEM students should not be reduced to merely using AI-generated outputs. Learners also need experiential encounters with programming in order to understand how computers operate through simple but precise instructions and how citizens can participate meaningfully in an AI-mediated information society. This paper presents a work-in-progress account of a university-level introductory informatics course in Japan for non-STEM students, particularly humanities-oriented learners, many of whom had not studied under the recently reformed K–12 informatics curriculum. The course was designed to begin with visual and embodied programming, before progressing to text-based programming, collaborative software construction, and reflection on generative AI. To design the course, we developed four pedagogical principles: (1) visible state change and concrete command targets; (2) abstraction into algorithmic procedure; (3) open-ended expression and ownership; and (4) distributed roles, interdependence, and systems thinking. Preliminary observations suggest recurring references to peer support and conceptual understanding tied to specific collaborative activities. Rather than claiming validated learning effects, the paper presents the course design and preliminary observations as a basis for future ethically structured research. It argues that, even when AI can generate code, educators still need to design opportunities for learners to jointly observe, discuss, and engage with computation.

Keywords: Informatics Education; Collaborative Learning; Non-STEM Students; Generative AI; Interdisciplinary Curriculum.

Building Teacher Self-Efficacy for Coding and Robotics Through Connected Professional Development: Evidence from a WhatsApp-Based Chatbot Intervention in South African Foundation Phase Education

Embeth Holly van der Wal, Ronel Callaghan and Jean Greyling

This paper reports on findings from the second cycle of a two-cycle Design Science Research (DSR) study examining how teacher self-efficacy (TSE) for Coding and Robotics can be developed among Foundation Phase educators in South Africa. The intervention under investigation is a WhatsApp-based chatbot professional development programme. A connected, asynchronous and low-infrastructure professional development opportunity designed to reach geographically dispersed teachers in under-resourced school contexts. Drawing on qualitative data from teacher participants and a course coordinator, the study identifies the mechanisms through which connected professional development activates and sustains TSE, while simultaneously exposing the structural and institutional conditions that constrain it. Three core principles of the study's Adapted TSE Framework (Version 1) were validated by the chatbot intervention data, and four emergent findings necessitated substantive theoretical refinement, producing the Revised TSE Framework (Version 2). Key contributions include the introduction of Pedagogical Content Knowledge (PCK) as a fifth source of efficacy information, teacher agency as a mediating construct within cognitive processing, and the critical distinction between individual self-efficacy and institutional implementation efficacy. The paper argues that connected professional development, when designed with contextual sensitivity, can powerfully develop teacher confidence in new and emerging curriculum subjects, but that individual efficacy gains are insufficient for sustained implementation without complementary institutional legitimacy and policy support.

Keywords: Teacher Self-Efficacy; Design Science Research; Coding And Robotics; Professional Development; Foundation Phase; Chatbot.

Teaching in the Feed: Authentic Digital Literacy Assessment in AI-Connected Learning Environments

Maree A. Skillen

The rapid expansion of artificial intelligence systems, algorithmic recommendation engines, and social media platforms has reshaped how learners encounter information, communicate, and construct knowledge within connected digital environments. Increasingly, learning occurs “in the feed” through algorithmically curated streams of content distributed across platforms such as TikTok, Instagram, search engines, and generative AI tools. Despite these shifts, digital literacy assessment in Initial Teacher Education continues to rely heavily on

competency-based and reflective approaches that may inadequately capture enacted, platform-mediated digital practice. This paper proposes a reconceptualisation of digital literacy assessment for AI-connected learning environments. Drawing on Design-Based Research situated within a Scholarship of Teaching and Learning framework, the paper presents a trace-based assessment intervention implemented within a first-semester Initial Teacher Education subject in Australia. The intervention involves a 48-hour Digital Practices Audit in which pre-service teachers document and analyse their digital activity across interconnected platforms. Early findings indicate that algorithmic systems are initially largely invisible to novice users, becoming visible only through structured engagement with digital traces that foreground their role as active epistemic mediators. The paper introduces a six-principle framework for authentic digital literacy assessment and argues that trace-based approaches can better connect assessment with contemporary AI-mediated digital practices than reflective or self-report-based models.

Keywords: Digital Literacy; Artificial Intelligence; Algorithmic Systems; Authentic Assessment; Initial Teacher Education; Design-Based Research; Scholarship Of Teaching And Learning.

14:15 – 15:45

TRACK C: TEACHER TRAINING, CREATIVE MAKER TOOLS & ROBOTICS (INGWE ROOM) |
Chair: Machdel Matthee

Preparing Teachers for Teaching Advanced AI: Insights from a Professional Development Offer

Franz Jetzinger, Sven Baumer, and Tilman Michaeli

As learning about AI is being integrated into computer science (CS) curricula worldwide, it is crucial to prepare teachers to teach this topic through appropriate professional development (PD). However, the literature on PD for teaching about AI in K-12 remains limited, particularly regarding PD that addresses advanced AI concepts beyond AI literacy. This experience report presents the design and implementation of a 2-day PD offer developed to support German CS teachers in teaching advanced AI concepts at the upper secondary level. The PD offer builds on established principles of effective PD, implements the principle of embedded ethics, and integrates various learner-centred activities. Drawing on observations and feedback from five iterations, we reflect on lessons learned, including teachers' appreciation for classroom-ready materials, the value of embedded ethics in AI PD, and challenges associated with open-ended project-based learning.

Keywords: AI; Professional Development; CS Education; K-12.

Students' and Teachers' Use of Generative AI in Computer Science Education in Schools – A Systematic Literature Review

Dominikus Häckel and Torsten Brinda

Generative AI (GenAI) tools are increasingly being used in educational contexts. However, in school computer science education (CSE), there remains limited clarity regarding the extent and the ways teachers and students use these tools. This systematic literature review examines the documented use of GenAI as a teaching and learning tool by teachers and students in school CSE, rather than focusing on AI literacy or AI as curricular content. In particular, the study examines types of use, forms of implementation, and curricular and instructional integration. The review was conducted in April 2026 in the ACM Digital Library, Scopus, and Web of Science and supplemented by Consensus and snowballing. The findings indicate that GenAI is primarily used via general chatbots such as ChatGPT or Gemini, while specific coding tools and intelligent tutorial systems are rarely used in these settings. Use is predominantly self-initiated: learners use GenAI informally for homework, comprehension questions, test preparation, or to increase efficiency; teachers primarily use it for material creation and lesson preparation. There is little evidence of systematic integration into instructional phases. The review thus reveals an early phase of GenAI use in CSE that is pragmatic, individualised, and not strongly curriculum driven. The central contribution lies in highlighting the gap between the widespread availability of GenAI and its systematic pedagogical and curricular integration, which has been sparsely documented to date.

Keywords: Computer Science Education; Generative AI; Usage Patterns; Secondary Education; Systematic Literature Review.

Making the Connected World Tangible: Design Knowledge from a Smart-Home Robotics Lesson Series in Secondary Computing Education

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Jana Afreen Ahmed and Ralf Romeike

Introductory computing education must enable students not only to use digital technologies, but also to understand and shape the connected systems that increasingly structure everyday life. This paper presents a smart-home-themed robotics lesson series for lower secondary computing education, implemented with LEGO SPIKE Prime. The design connects fundamental programming concepts with tangible automation scenarios such as motion-controlled lighting, access systems, environmental sensing, and parallel device behaviour. Drawing on constructionist learning theory, context-oriented computing education, and educational robotics, the lesson series aims to make concepts such as conditionals, loops, variables, lists, functions, and parallel processes observable through the behaviour of physical artifacts. The paper reports on a first design-based classroom iteration with seven lower-secondary students in an extracurricular computing club. Data from observations, student feedback, and reflective design analysis were used to identify implementation challenges and opportunities for refinement. The analysis suggests that smart-home scenarios can support engagement and conceptual access, while also revealing tensions between open construction, technical complexity, and the need for structured guidance. In particular, hardware behaviour—such as sensor thresholds, calibration, timing, and state initialization—emerged not merely as a source of difficulty, but as an opportunity for addressing computing concepts when made explicit through facilitation. The contribution of the paper lies in translating this first implementation into design knowledge for beginner-oriented robotics education and in showing how smart-home contexts can make the computational logic of connected everyday systems accessible to learners.

Keywords: Computing Education; Physical Computing; Educational Robotics; Constructionism; Smart Home; Design-Based Research; Secondary Education.

Moving from Cognitive Surrender back to Critical Thinking: Training GenAI Chatbots as Socratic Co-Facilitators

Corna Olivier, Lizette Weilbach, and Carina de Villiers

The integration of Generative AI (GenAI) in higher education presents both opportunities and challenges for student learning. Strong linguistic and cognitive support is offered by these tools, but recent research raises concerns regarding cognitive surrender, wherein students rely excessively on automated chatbot responses for critical thinking tasks. To maintain cognitive presence and promote inquiry-based learning, this study investigates a GenAI chatbot designed to function as a Socratic co-facilitator within the Community of Inquiry (CoI) framework. Developed and implemented as an Intelligent Tutoring System (ITS) in an online higher education course, the study employs a mixed-methods Design Science Research (DSR) approach. The study highlights a recurring tension between facilitating cognitive outsourcing and supporting authentic learning, revealing that constructive, educational responses are vital for preserving student agency and intellectual ownership. By repositioning GenAI chatbots as Socratic learning partners rather than automated answer engines, this paper offers practical design guidelines to foster critical thinking in digital learning environments. Key guidelines include implementing conceptual clarification to help students identify knowledge gaps, using Socratic questioning to prompt active investigation and conceptual application, and employing metacognitive prompting to foster reflection and well-reasoned conclusions. Furthermore, chatbots must manage assessment boundaries constructively by refusing direct answer requests and reframing interactions to scaffold students step-by-step through the triggering, exploration, integration, and resolution phases of cognitive presence while preserving student agency and intellectual ownership. By repositioning GenAI chatbots as Socratic learning partners, this paper offers practical guidance to sustain critical thinking in digital learning environments.

Keywords: Cognitive Presence; Community of Inquiry (CoI); Generative Artificial Intelligence (GenAI); GenAI Chatbots; Intelligent Tutoring Systems (ITS); Socratic Facilitation.

14:15 – 15:45

TRACK D: Computer science and computational thinking (MHELEMBE ROOM) | Chair: Margaret Leahy

Narrativity in Computer Science Education: An Analysis of Bebras Tasks

Michael Weigend

This contribution investigates narrativity and storyworlds in Bebras tasks, short problem-solving tasks used in an international computational thinking contest. A corpus of 898 accepted tasks from 2020 to 2025 was analyzed with prompt-based AI coding. The study examined narrative features in task bodies and answer explanations, recurring storyworld themes, and the relationship between these storyworlds and leisure activities reported in the German KIM and JIM studies. The results show that narrative features are common but unevenly distributed: characters appear in about three quarters of task bodies, while dialogue and suspense-oriented explanation openings are rare. Semantic clustering of storyworld keywords produced 101 themes, including paths and navigation, games and puzzles, visual patterns, and drawing. Comparisons with German leisure activity data indicate that Bebras tasks selectively reflect children's and adolescents' everyday lives. The paper argues that narrativity and contextualized storyworlds can be useful design resources for future computer science learning materials, especially in an era of generative AI.

Keywords: Computer Science Education; Narrativity; Bebras contest.

Students' Readiness for Nested Programming Constructs: A Qualitative Analysis Using the Computational Thinking Test (CTt)

Jayanti Nayak, Therese Keane, Tanya Linden and Milorad Cerovac

Nested constructs present a common challenge for students, particularly in the early stages of learning programming. At the secondary school level, students are often expected to implement nested constructs in programming tasks, yet their readiness to work with these structures is not always explicitly assessed. Research on assessment practices that identify students' readiness to apply nested constructs remains limited. To address this gap, this study explores the *Computational Thinking Test* (CTt) as a formative assessment tool for evaluating secondary students' ability to work with nested constructs. This study presents findings from a qualitative analysis of 12 students in Years 9 to 11, drawing on scores from the *Existence of Nesting* dimension of the CTt, and performance on a custom-designed programming task. The findings revealed variations in performance within the same class, alignment between performance on the CTt and the quality of the custom-designed programming task, and consistent patterns at the lowest and highest quartiles. The results indicate that the CTt may serve as a rapid screening tool to assess students' readiness to implement nested constructs, thereby support formative and differentiated instruction.

Keywords: Programming; Formative Assessment; Computational Thinking; Computational Thinking Test; Nested Constructs; Secondary School.

The Impact of Educational Robotics on Computational Thinking Skills among STEM Students: Benefits and Challenges of Implementation

Chinedu Okonkwo and Amos Anele

This study investigated the impact of educational robotics on the development of computational thinking skills among STEM students while examining the benefits and challenges associated with its implementation. Grounded in Constructionism Theory, the study adopted a quantitative research approach using a cross-sectional survey design. Data were collected from 276 STEM students through a structured questionnaire measuring educational robotics exposure, student engagement, collaboration, creativity and innovation, problem-solving skills, computational thinking skills, and implementation factors. Descriptive statistics, reliability analysis, correlation analysis, and multiple regression analysis were employed to analyse the data. The findings revealed that students held moderately positive perceptions regarding educational robotics and its contribution to learning outcomes. Reliability analysis confirmed excellent internal consistency across all constructs, with Cronbach's alpha values exceeding the recommended threshold of 0.70. Correlation analysis demonstrated

significant positive relationships among all study variables, with educational robotics exposure showing the strongest association with computational thinking skills. Multiple regression results indicated that educational robotics exposure, student engagement, collaboration, creativity and innovation, problem-solving skills, and implementation factors significantly predicted computational thinking skills, explaining 72.4% of the variance. Implementation factors, student engagement, and creativity emerged as the strongest predictors. The study concludes that educational robotics serves as an effective pedagogical approach for enhancing computational thinking skills among STEM students, although successful implementation depends on adequate resources, infrastructure, teacher competence, curriculum integration, and institutional support. The findings contribute to the growing body of knowledge on technology-enhanced STEM education and provide practical recommendations for educational institutions seeking to integrate robotics-based learning environments.

Keywords: Educational Robotics; Computational Thinking Skills; STEM Education; Student Engagement; Creativity And Innovation; Problem-Solving Skills.

From Theory to Practice: Assessing Soft Skills through Continuous Assessment Using the "What, So What, Now What" Reflection Framework

Adriana Aletta Steyn and Sollie Millard

In an ever-changing higher education landscape, cultivating and assessing soft skills remain critical, yet we struggle to measure them. While it is easier to assess technical competencies, assessing non-technical skills often lacks rigour and structure within traditional curricula. This study investigates how a continuous assessment model was integrated into team-building activities, using structured reflective journals to develop these skills. Grounded in Borton's reflective framework, two hundred and sixteen reflective journals from university students were analysed using text mining and thematic analysis. The reflections were mapped onto three cognitive dimensions: What, So What and Now What. Analysis of student reflections reveals, amongst other things, the importance of relationships within team dynamics, and anchoring these reflections in a team-based continuous assessment externalises the hidden process of soft skills development. It was clear that students progressed from superficial descriptions of team dynamics to deeper critical self-regulation, self-awareness, and professional identity development. Incorporating reflection into non-technical competency assessments contributes to the domains of Information Systems (IS) education and assessment theory. In practice, it offers educators an evidence-based approach to making soft skills visible and measurable, informing curriculum design for professional programs.

Keywords: Borton's Reflective Model; Continuous Assessment; Higher Education; Reflective Journaling; Soft Skills; Topic Modelling.

Conference day 4: Thursday 22 October 2026

09:30 – 10:30

TRACK 1A: VIRTUAL SESSION 1A: PRIMARY/SECONDARY GENDER & TECH EDUCATION (INGWE ROOM & ZOOM A) | Chair: Margaret Leahy

E-Learning for E-Gov in Post-Conflict Somalia via Learning Passport

Mohamed Nuh and Mikko Ruohonen

In post-conflict contexts such as Somalia and its federal member state of Puntland, the introduction of e-government and e-learning initiatives is confronted with substantial technological, organizational, and environmental challenges. This study employs the Technology–Organization–Environment (TOE) framework to examine the deployment of the Learning Passport e-learning platform in Puntland as part of broader digital public service delivery efforts. Based on qualitative interviews with relevant stakeholders, the findings indicate that technological aspects, particularly system usability and the availability of digital learning content, supported initial adoption. However, long-term sustainability was constrained by organizational factors, including limited institutional capacity, reliance on external donors, and deficiencies in project coordination and management. In addition, environmental conditions such as weak governance structures, socio-economic inequalities, and inadequate ICT infrastructure further limited the platform's overall effectiveness. The study highlights the importance of context-sensitive and integrated approaches when implementing digital governance and e-

learning solutions in fragile and post-conflict settings. It contributes empirical insights to the literature on digital governance and provides practical implications for policymakers and development partners operating in similar environments.

Keywords: e-Government; e-Learning; Post-Conflict Countries; Implementation Challenges; TOE Framework; Technological Factors; Organizational Factors; Environmental Factors.

Gender in AI Literacy Education: A Systematic Review on Girls, Artificial Intelligence Literacy, and Education in the Age of AI

Cody Jackson, Therese Keane, and Milorad Cerovac

As international efforts intensify to encourage girls' participation in technological fields, AI literacy is increasingly being positioned as a core component within K–12 education for advancing gender inclusivity within computing and AI education. Despite growing attention to AI literacy, there is limited research examining how gender disparities shape girls' access to, engagement with, and confidence in AI learning at the K–12 education levels. The present systematic review examines AI literacy for school-aged girls by synthesising current pre-tertiary frameworks to examine evidence of gendered differences in AI learning and assess how existing literature conceptualises and responds to gender disparities in AI education. Using a structured search strategy across ERIC, Scopus, and Web of Science, 9 articles published between 2022 and 2026 were identified. A qualitative thematic analysis was conducted to identify key themes within AI literacy frameworks and to examine how gender is addressed within the emerging AI education literature. The small number of eligible studies highlights a significant gap in research at the intersection of AI literacy, gender, and K–12 education. This review offers implications for educators, researchers, and policymakers seeking to address the sociocultural barriers that influence girls' motivation, confidence and participation in AI education, and to explore options for further research on gender inclusivity in AI and computer education.

Keywords: AI Literacy; K–12 AI Education; Girls; Gender Equity.

Preparing Teachers in the Age of AI: a study with Portuguese trainees

Ana Amélia A. Carvalho and Adelina Moura

This article presents a case study examining a Generative AI (GenAI) professional development course designed for teachers of primary and secondary education. The course aimed to equip teachers with the knowledge, skills, and critical awareness needed to integrate GenAI tools meaningfully and responsibly into their teaching practices. Data were collected through trainee activities, written reflections, a course evaluation questionnaire, and an interview with the trainer. The results indicate a high level of training quality. Trainees successfully designed lesson plans, created educational resources, and developed classroom activities integrating GenAI tools, while demonstrating sound awareness of the ethical, equitable, and pedagogical dimensions of AI use in education. They engaged actively in the proposed tasks, both individually and collaboratively. The findings reflect a strong alignment between the course design, the pedagogical approach adopted, and the trainees' expectations and professional needs. Trainees valued the trainer's interpersonal skills, pedagogical competence, and ability to foster a positive and productive learning environment. These results suggest that thoughtfully designed, practice-oriented GenAI training can effectively support teachers in developing AI-related competencies. The course documented in this study may serve as a valuable reference model for the design and implementation of future AI teacher training initiatives in Portugal and beyond.

Keywords: GenAI; Teachers; Training course.

09:30 – 10:00

TRACK 1B: VIRTUAL SESSION 1B: HIGHER EDUCATION PLATFORMS & LEARNING DATA
(MHELEMBE ROOM & ZOOM B) | Chair: Riana Steyn

Operationalizing Digital Competence in Higher Education: A Construct-Validity Study Using Moodle Event Data

Tsakani Justice Baloyi and Nazeer Joseph

This study investigates whether Learning Management System (LMS) event data can function as empirically defensible indicators of digital competences by aligning Moodle Event API descriptions with DigComp competence definitions. Using semantic similarity modelling with Sentence-BERT embeddings, Moodle events were mapped to competence statements and evaluated through a construct-validity lens grounded in Messick's unified validity framework. Results show that Moodle events exhibit systematic but uneven alignment with DigComp competences. Assessment and learning-progression events demonstrate comparatively strong and consistent construct validity, while peripheral system and navigation events provide weak and diffuse competence signals. Structural validity remains limited overall, reflecting known characteristics of embedding-based similarity approaches, yet convergent evidence across validity dimensions identifies a subset of events suitable for competence-oriented analytics. The study contributes methodologically by demonstrating how LMS trace data can be interpreted within a rigorous validity argument, and conceptually by advancing DigComp from a descriptive framework toward a data-informed measurement reference. The findings offer practical guidance for developing theoretically grounded, scalable digital competence assessment in higher education.

Keywords: Digital Literacy; DigComp; Digital Competence; Learning Analytics; Semantic Similarity Analysis.

Using Blackboard LMS with AI for Action Research

Wesley Moonsamy, Hugo Lotriet and Hanlie Smuts

This paper provides a conceptualisation of the way in which Blackboard Learning Management System (LMS) with Artificial Intelligence (AI) functionality can be used for Action Research (AR). The research is based on an example from an existing research project involving a group of South African graduate students in Information Systems, conducted by the researchers. In the example research experiment, the researchers aimed to determine how postgraduate students learn a topic from an advanced Information Systems subject, Enterprise Architecture. To achieve this, the researchers employed the AR methodology in three cycles to test three cohorts of postgraduate students. The researchers configured Blackboard LMS to support three different learning styles for each of the cohorts: (1) Theory only - participants learn the topic using three theory documents; (2) AI only - participants learn the topic using Blackboard's AI Conversation (chatbot) functionality; (3) Theory and AI - participants learn the topic using both theory documents and AI. This paper therefore provides a critical reflection on the characteristics of AR, and the implications for the use of Blackboard as a tool for conducting AR. The provided example describes the set-up that was used in Blackboard, how it supports the nature of AR, and the authors reflect on lessons learnt about using Blackboard with AI for AR in an experimental setting. The researchers found three principles which support the primary characteristics of AR to be useful; (1) Automate – requires more effort when configuring the experiment but reduces the workload when running the experiment; (2) Cascade – content must be released to the students in the intended sequence; (3) Personalise – create an engaging experience for the students and configure the components of the course to collect contextualised data which facilitates the analysis process. Some lessons learnt include (1) The researchers started by requesting administrative rights on a new course. This allowed the researchers to enrol students and to open and close the course. Most standard lecturer roles do not support enrolling students; (2) The researchers configured components such as the course in a reusable manner; (3) Group sets and groups were configured for all cycles of the research, saving time for the next cycles.

Keywords: Action Research; Artificial Intelligence; Blackboard; Graduate students; Information Systems.

10:45 – 11:30

Virtual Short Paper Session (INGWE ROOM & ZOOM A) | Chair: Milorad Cerovac

From AI Item Generation to Trustworthy Public Assessment: A Human-in-the-Loop Framework for Low-Resource Contexts

Louisa Muparuri

Public examination systems are under growing pressure to provide credible, curriculum-aligned assessment at scale while containing costs that are often subsidized by government. Generative artificial intelligence (AI) presents opportunities to accelerate item drafting, diversify question pools and reduce routine workload, but its fluent outputs can create a false sense of quality. This short paper presents a human-in-the-loop framework derived from the development and early evaluation of an AI-assisted item generation prototype for public assessment in a low-resource context. The prototype generates draft items aligned to subject, syllabus topic, learning objective, cognitive level and question type, while subject matter experts retain authority to accept, reject, revise, contextualise and approve outputs. The paper argues that the core innovation is not automation alone, but a governed workflow that combines AI-assisted productivity with human expertise, auditability, contextual language review and learner protection. Early evaluation suggests that AI can reduce cycle time and support item variety, but quality depends on structured review gates that test syllabus alignment, clarity, bias, ambiguity and contextual appropriateness. The contribution is a practical governance and evaluation model for assessment bodies seeking to adopt AI responsibly without weakening validity, fairness or public trust.

Keywords: Artificial Intelligence In Education; Item Generation; Public Assessment; Human-In-The-Loop; Assessment Integrity; Low-Resource Contexts; Responsible AI.

Exploring Student Narratives of Generative AI Use in Academic Writing: Tensions Between Academic Integrity, Agency, and Identity- A Pilot Study

Uchita Bakshani

This pilot study explores how postgraduate students describe their experiences of using generative artificial intelligence (GenAI) for academic writing, and the tensions they face around academic integrity, learning, and identity. Guided by Cultural-Historical Activity Theory (CHAT), it uses narrative inquiry to examine how three postgraduate students navigate the tension between GenAI tools and academic integrity guidelines. The narratives reveal both opportunities and challenges: some students view GenAI as a helpful partner, while others feel guilt or pressure to use it to manage heavy workloads. Across all three, academic integrity emerges as less about strict rule-following and more about careful, ethical decision-making. This pilot study contributes preliminary, student-centred insights to inform equitable AI policies in higher education, with findings intended to guide a larger, more comprehensive study.

Keywords: GenAI; Academic Writing; Learner Agency; Cultural-Historical Activity Theory (CHAT); Narrative Inquiry.

Using a Wiki to Connect and Engage Students

Daryl Hepting, Swe Zin Ei and Julia Hu

This paper investigates the use of a Moodle wiki as a central hub for organizing course materials, documenting class meetings, and supporting student collaboration in a university-level course. The wiki is organized around individual course meetings and uses a consistent structure that includes plans for meetings, post-meeting resources, and student contributions. Instructor-provided materials include audio transcripts and photographs of whiteboards. Students work with these materials by editing transcripts, adding captions to photographs, recording action items, contributing commentary and discussion, and creating fair exam questions with answers. Students are organized into small WikiGroups, with each group assigned to edit the wiki for one or two meetings. Each student creates a personal wiki page (PWP) that includes their name and the name that they like to be called. The PWP provides a way to identify their contributions to the wiki in a simple way using Creole format: [[<PWP>]]. The wiki's page history provides a record of edits and contributions. This approach brings course materials, meeting documentation, and student contributions together in a single location while supporting asynchronous collaboration and providing an accessible record of course activities. The paper describes the design and implementation of this approach, building on earlier experience with Moodle wikis and addressing

limitations related to communication, coordination, and visibility of individual contributions. The current implementation provides a structured process for group work and individual contributions within each meeting page. The approach is currently being used in an ongoing course, and further evaluation will examine student participation, feedback, and the effectiveness of the wiki in supporting collaborative learning.

Keywords: Moodle; Wiki; Collaborative Learning; Student Engagement; Knowledge Construction

Conceptualisation of Early Childhood Teachers' AI Literacy in AI-Integrated Educational Practice

Yuying Pei, Sarah Prestridge, Therese Keane, and Susanne Garvis

The focus of AI literacy research has increasingly shifted from the broader public to more specific educational contexts; however, limited attention has been paid to early childhood teachers' AI literacy. As AI becomes more embedded in educational practice, early childhood teachers are expected to make informed decisions about its use to support young children's learning and development. Drawing on the existing AI literacy literature, this paper identifies key limitations and proposes a conceptual framework for understanding early childhood teachers' AI literacy in AI-integrated educational practice. The framework comprises five interconnected dimensions: foundational AI understanding, practical AI application, critical and ethical engagement, pedagogical AI integration, and social and contextual awareness. This paper contributes a more contextualised account of early childhood teachers' AI literacy and argues that such literacy should be aligned with the educational settings in which teachers work.

Keywords: Teachers' AI Literacy; Early Childhood Education; Early Childhood Teachers.

14:30 – 16:00

TRACK 2A: VIRTUAL SESSION 2A: COMPETENCY PATHWAYS, TEACHERS & PRACTICE SCALING (INGWE ROOM & ZOOM A) | Chair: Torsten Brinda

Explicating AI Systems as Curricular Objects of Reference: Deriving the Computing Dimension of Teachers' AI Competence Across Subjects

Uwe Lorenz

Teachers across subjects are increasingly expected to use AI-based tools, evaluate their educational implications, and address AI-related changes in teaching, learning, assessment, and subject-specific contents, methods, and knowledge practices. Yet curriculum development faces a conceptual problem: "AI" is historically shifting, context-dependent, often anthropomorphically loaded, and frequently tied to short-lived applications. A review of existing definitions can document this plurality, but it cannot by itself determine which concept should guide the derivation of learning goals for teacher education. This paper addresses this problem by explicating "AI system" as a curricular object of reference. Drawing on explication as conceptual re-engineering, it develops a purpose-bound concept of AI systems as goal-oriented computing systems whose concrete output behaviour is not fully pre-specified but shaped by rule-guided open-ended processes such as search, inference, optimization, or adaptation, or by products of such processes. Using this explicatum as an analytical reference point, the paper relates characteristics of AI systems to teacher-relevant phenomena in professional contexts, examines these phenomena in terms of AI system classes and computational properties that help explain them, and uses these relations to derive computing-related contents and competence-oriented learning goals. The contribution is a conceptually grounded derivation logic for identifying computing-related contents and learning goals from AI-related phenomena in teachers' professional contexts. It shows how computing education can provide explanatory concepts for understanding these phenomena, while their curricular selection and depth are guided by their professional relevance for teachers across subjects.

Keywords: Artificial Intelligence; AI System; Teacher Education; Computing Education; AI Literacy; Curriculum Development; Explication.

Gender Differences in Adolescent Students' Interactions with Project-Based Learning with Technology

Vinay Lautre, Amina Charania and Sandeep Wadhe

Project-Based Learning (PBL) integrating digital technologies is widely recognised for promoting collaboration, inquiry, problem-solving, and digital competence. Some studies suggest that boys generally feel more confident with technology than girls do. This gap widens in adolescence, when technology is seen as a boys' area. Such stereotypes can make girls doubt themselves in tech activities, even when they are fully capable. However, little is known about how boys and girls participate in technology-supported PBL in Indian school contexts. This study explored gender differences in adolescent students' participation and interactions, and technology use during PBL with Technology (PBLT) in a government school setting. The study employed a qualitative observational design conducted from July 2022 to December 2022. A total of 36 students (18 boys, 18 girls) across 8 groups were observed during project-making activities. Thirteen observation sessions were conducted, each lasting 20–30 minutes. Seven groups were observed only once each to identify broad themes that emerged during observations, such as technology device control, assertive behaviour, peer encouragement and guidance, seeking the teacher's help, applying knowledge, and observational participation. After themes were finalised, one group was selected as a revelatory case because it had equal gender representation (two boys, two girls) and was observed continuously for six sessions over two weeks across two projects on Body Mass Index (BMI) and Air Quality Index (AQI). This allowed extended observation of participation, technology use, and behavioural patterns over time. Data were analysed using inductive thematic analysis focusing on technology control, assertive behaviour, peer guidance, teacher-seeking behaviour, knowledge application, data entry, and observational participation. The findings challenge long-standing assumptions that boys are more confident, skilled, or engaged than girls in using digital technologies and participating in technology-supported learning. Like the recent study findings from other countries, girls in this study were significantly more active, assertive, and directive than boys across observed sessions. They opened the laptop, typed queries, corrected errors, called teachers, guided peers, and physically took control of the device when needed. Boys participated productively at times but more often as guided contributors than independent initiators. Girls applied subject knowledge more frequently and accurately, using formulas, converting units, and distinguishing Air Quality Index (AQI) from weather data, compared to boys. Help-seeking also differed; girls asked specific, task-focused questions and reported errors clearly, while boys rarely sought help independently. Five of the eight recorded observed incidents of highly assertive behaviour involved girls. The study does not claim generalizability; it offers analytical depth through a revelatory case. The findings suggest that when given access to technology, girls from disadvantaged backgrounds do not withdraw; they step forward and lead.

Keywords: Project-Based Learning; Educational Technology; Gender; Adolescent Learners.

Competency-Aligned Learning Pathways for AI in Secondary Computer Science Education

Stefan Pasterk, Corinna Mößlacher and Andreas Bollin

The rapid diffusion of artificial intelligence (AI) challenges secondary computer science (CS) education to move beyond isolated AI activities toward coherent learning progressions grounded in prerequisite CS knowledge. This paper investigates how AI competencies can be linked to existing CS learning outcomes to identify feasible pathways for secondary education. We link CSTA 2024 and UNESCO AI using a dependency graph, identify key pathways from foundational computer science competencies to AI competencies, and derive practical recommendations. The resulting graph makes visible how AI competencies depend on foundational CS areas such as algorithms, programming, data and analysis, computing systems and security, and future preparation. We present the synthesized model and discuss selected pathways leading to competencies in ethics of AI, human-centred mindset, AI techniques and applications, and AI system design. The analysis shows that even seemingly non-technical AI competencies often require substantial prior CS knowledge, while some ethical and societal aspects can be introduced comparatively early through existing CS outcomes. The paper contributes a graph-based method for aligning AI competency frameworks with CS standards and derives recommendations for designing coherent, competency-aligned AI learning pathways in secondary CS education.

Keywords: Informatics Education; Secondary Education; Artificial Intelligence Education; Learning Pathways; Competency Frameworks.

Recommendations for Scaling, Modification and Sustainability of Video based or Similar Programmes in Government-Run Middle and Secondary Schools in India

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Amina Charania, Durba Sarkar, Jayanth Nadheri and Bushra Parveen

Rapid growth in Indian educational technology catalysed by government and philanthropic investments and policy mandates like the National Education Policy (NEP) 2020, has accelerated digital infrastructure deployment in public education. However, a systemic gap in integration of digital technologies in curriculum and pedagogy persists, and this gets visible when a smart hardware deployment fails to impact academic outcomes and pedagogical shift. This paper makes recommendations based on the finding of the study that evaluated the implementation, modification, and sustainability of a whole-class Video-Based Learning (VBL) program across 64 government-run middle and secondary schools in India. These recommendations were not part of the study report, and are based on the current literature, the Indian schooling and education policy context, and authors' insights and interpretation of the findings and its application. This intervention used an Android-based system on a flat-screen TV (about 80 centimetres screen), enabled by a USB pen drive (plug-in and play) for uploading video-based content (on math and science) from the digital content developed by a philanthropy organization. Besides using this digital content, the Android-based system allowed teachers to display videos from YouTube. This technology largely supported VBL for the whole class, where the TV shares the central space with the chalk or pen board and the teacher. Comprehensive policy recommendations were made across the key dimensions: inclusive ergonomic ICT infrastructure design, role of communities in sustaining and maintaining infrastructure, contextually relevant video content, teacher capacity building for interactive whole-class directive methodologies, suggestions for overall professional learning of teachers, and enhanced digital interoperability. Ultimately, the paper argues that sustaining technology-enabled pedagogy in underprivileged school systems requires moving beyond mere device access to actively fostering teacher digital agency, shifting institutional beliefs, and leveraging school infrastructure as local community resource hubs.

Keywords: Project-Based Learning; Video-Based Learning; Educational Technology Policy; Government Run Schools; Digital Agency; Digital Inclusion.

14:30 – 16:00

TRACK 2B: VIRTUAL SESSION 2B: ACADEMIC INTEGRITY, INFORMATION TRUST & ROLE SHIFTS (MHELEMBE ROOM & ZOOM B) | Chair: Sharon Singh

A Consideration of Local Echo Chambers in Information Trust Evaluation: Through a Case Analysis of Literacy Education

Sayaka Tohyama and Jun Ichikawa

Closed Social Networking Services (SNS), used only by a defined group of users, have long been used in education. Because early closed SNS had no recommendation system and every user was known to the others, they were expected to be less prone to two related phenomena: filter bubbles, in which an algorithm narrows the information a user sees; and echo chambers, in which people are repeatedly exposed to opinions similar to their own. In recent years, however, many closed platforms used in education also incorporate recommendation and ranking algorithms, so the absence of personalised recommendation can no longer be assumed, and it is no longer clear whether community-dependent credibility judgements in such environments originate from the algorithm or from the shared community itself. The notion of a "local echo chamber" suggests that such judgements can arise within a small community even where no such personalisation is present. This preliminary study therefore uses a closed SNS deliberately built on a platform that does not tailor what each user sees (Slido) and examines how the local or non-local nature of information relates to the way university students judge whether a post can be trusted. As part of a literacy education programme for first-year students at two Japanese universities (University A, N = 14; University B, N = 34), each university built its own closed SNS, where senior students posted information about their own campus. Participants viewed both their own university's SNS and the other university's SNS, chose the post they trusted most from each, and explained their reasons in free text. Their free-text responses were coded into categories: reasons appealing to first-hand verification were more frequent for posts from their own university, whereas reasons appealing to agreement among other users were more frequent for posts from the other university. In addition, on their own university's SNS some students

trusted an entire post, including an unverified interpretation attached to a verifiable fact. These descriptive patterns are consistent with the idea that sharing a local community could support the formation of a local echo chamber even in the absence of personalised recommendation, although the small and uneven samples mean the findings cannot be generalised. We discuss the implications for digital citizenship education, together with the limitations of the study and directions for a more rigorous follow-up design.

Keywords: Local Echo Chamber; Community; Social Networking Service (SNS); Literacy Education.

Ensuring Academic Integrity in the Age of Voice Cloning: Evaluating Verbal Verification for Micro-credentials.

Oyena Mahlasela and Adriana Aletta Steyn

Voice cloning has transformed verbal verification from a trusted security layer into a highly scalable attack surface for online micro-credentials. Drawing on Technology Threat Avoidance Theory (TTAT) to understand how institutions appraise and cope with this maturing vulnerability, this study employed a comparative detection experimental methodology to evaluate deployable countermeasures under realistic operational conditions. The evaluation reveals that simple voice detection works. However, catching fakes is much harder when audio quality is poor, as in standard video calls on mobile devices. This could disadvantage learners from rural areas or those taking a test in a noisy environment. Therefore, for the e-learning community, these findings suggest that using voice checks should be part of a multi-layered security strategy that adapts as AI improves.

Keywords: Audio Deepfake Detection; Voice Cloning; Anti-Spoofing; Micro-Credential Verification; Lifelong Learning; E-Learning

From Displacement to Evolution: Unbundling the Educator Role under AI-Enabled Learning

Gabriel D. Hoffman and Adheesh Budree

Higher-education educators increasingly fear that AI-enabled learning systems will displace their roles, deskill their practice, and license institutional surveillance. This article argues the fear is rational but misdirected: displacement is produced not by the technology but by how it is governed, so it is best read as a governance failure in existing AI-in-education implementations rather than an inevitability. Drawing on the labour-process tradition, in which automation both displaces and reinstates labour by creating new tasks, and on the unbundling of professional work, the article reframes the AI-educator relationship as professional role evolution rather than replacement, and specifies the architectural conditions under which evolution, rather than precarity, results. Through a structured re-reading of the design logic of a doctoral framework for South African and Southern African Development Community (SADC) higher education, validated through Design Science Research against nine expert archetypes, the article makes three contributions. First, it treats an augmentation-over-automation principle as a binding architectural commitment: AI augments professional judgement but never substitutes for it, and high-stakes decisions (assessment, welfare plans, academic warnings) require human authority. Second, it unbundles the monolithic educator role into four interconnected specialisations (Learning Architect, Ethical Steward, Assessment Specialist, Innovation Catalyst), each grounded in an existing knowledge base. Third, it extends privacy-by-default protection to educators: performance data are anonymised before aggregation, and individual performance surveillance is architecturally prohibited. This study contributes to academic-labour scholarship a demonstration that AI need not produce professional precarity when architectural commitments explicitly protect educator agency, privacy, and professional identity.

Keywords: Educator Roles; Augmentation; Academic Labour; Professional Identity; Human-AI Collaboration; Unbundling; Privacy-By-Default; Higher Education