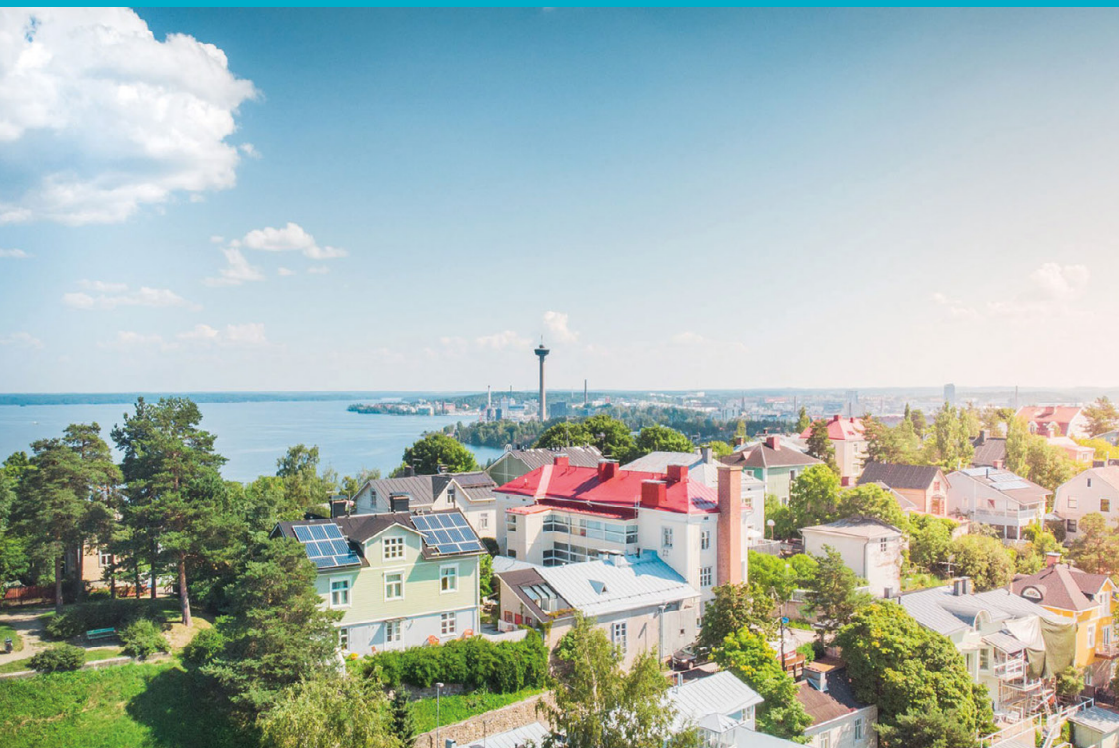
OCCE 2021 DTEL

17-20 AUGUST 2021 TAMPERE, FINLAND

DIGITAL TRANSFORMATION OF EDUCATION AND LEARNING

BOOK OF CONFERENCE ABSTRACTS



CONTENTS

Welcome to IFIP TC3 OCCE 2021

IFIP (International Federation for Information Processing) is the leading multinational and apolitical organization in Information and Communications Technologies and Sciences. It is recognised by United Nations and other world bodies representing more than 40 countries/ regions all over the world. The core activity of IFIP is run by +100 working groups and 13 technical committees linking together professionals from academia and industry; from science, policymaking and practitioners. The education committee, labelled TC3, have four working groups:

WG 3.1: Informatics and Digital Technologies in School Education
WG 3.3: Research into Educational Applications of Information Technologies
WG 3.4: Professional, Higher and Vocational Education in ICT
WG 3.7: Information Technology in Educational Management

The aims are to establish and maintain liaison between national and international individuals and organisations fostering cooperative action, collaborative research and information exchange including interdisciplinary work and networks. This also includes identifying subjects for research and projects that will support future developments.

I am delighted that IFIP TC3 is able to hold a conference in 2021. This is a very special conference – it is not just a hybrid conference, but the first hybrid conference that IFIP TC3 has run, and, I believe the first hybrid conference that IFIP as a whole has run! So, do please come and make news!

I am indebted to the co-chairs, organisers and programme committee of this event for planning this conference within such a short lead-time, to enable us all to benefit from continued shared experiences. I have no doubt that the opportunity to come to Tampere in Finland will be welcomed by many, coming after such a long period of distancing and restricted travel. And should the current situation of necessary restrictions continue, the hybrid possibility will allow us to work around such dilemmas.

We must not forget a crucial element of the conference is the wonderful celebration of Working Group 3.4's 50th anniversary! So, please do attend and help to celebrate this remarkable achievement. And what better way to celebrate, than to have chance to seriously consider the topic of the conference - Digital Transformation of Education and Learning - Past, Present and Future – a perfect time to do this. What better reasons can I offer – please come and join us – and welcome!

Professor Don Passey, IFIP TC 3 chair

Welcome to Tampere University!

It is my pleasure to welcome you all to IFIP TC3 OCCE 2021 DTEL conference held in a hybrid form at Tampere University in coming August'21. While writing this amidst the COVID-19 pandemic a conference on digital transformation in a hybrid form seems to be a very timely and good idea.

Digital transformation has many faces and many definitions, for me it is currently the fact that my office as the faculty dean, my local bank, my cinema and shopping center are located mostly at the same location, whether it happens to be at home or at my cottage home with my laptop, tablet or phone. But these are just the things that are already here, some accelerated because of the pandemic, but all those being coming a long time. More interesting are those things yet to come. In my thinking one of the big ones is the digital transformation of education. Even if over-simplifying a complicated matter, education has been a local endeavor with good international networks. We might see a rapid change to more global endeavor with much stronger networks and stronger competition to local education- thus the conference theme "Digital Transformation of Education and Learning - Past, Present and Future" is a very timely and interesting!

Dean Jyrki Vuorinen

Dear OCCE2021 DTEL participants

More than a year ago we noticed that we are rapidly entering the celebration year of the IFIP Working group 3.4. Fifty years ago a key group of professional people from academia, industry and societies decided to found a working group under IFIP TC3 i.e. Technical Committee 3 Education. And the WG has evolved and continues its activities. So, what would be a better way to celebrate an international work together than organizing a full conference and an anniversary symposium (which will be arranged on 20 August´21 morning).

We are really happy that TC3 board decided to extend this conference a full TC3 conference in which members of several working groups can contribute in many ways. Later we also got the status of "IFIP 60 years event" we are proud of. We got a number of submissions which will lead to many published papers, relevant action plans, collaboration initiatives and other contributions.

Due to the pandemic times we decided to arrange, seemingly, the first TC3 hybrid conference meaning both onsite and virtual conference operations. Our organizing team has worked hard to enable smooth collaboration either physically, virtually or in a mixed mode. We thank the core attending group of participants coming to Tampere and Finland and those online participants who could not travel but contributed with their submissions and the virtual presence at the conference.

We are grateful for the supporting work and encouragements of International Program Committee members Don Passey, Javier Osorio, Peter Micheuz and Margaret Leahy and naturally for our financial sponsors, Tampere University Foundation, FinCEAL Plus Bridges Program (UniPID) and TIVIA, the Finnish Information Processing Association of thousands of ICT professionals.

Looking forward to a successful conference and welcome to Tampere and Finland!

On behalf of the OCCE2021 DTEL IPC and OC

Jaana and Mikko

Keynote Speaker Mikko-Jussi Laakso

Associate professor

Director of the Centre for Learning Analytics

University of Turku, Finland

Nationwide Research-Based Development of Education with Learning Analytics

The Centre for Learning Analytics at the University of Turku, Finland, aims to advance the utilization of education technology and learning analytics for the entire span of the Finnish education system. The centre is a multidisciplinary research unit and main research areas are eAssessment, blended learning, math & programming education, gamification, digital pedagogies and learning design, learning analytics, machine Learning & AI in Education. It works in conjunction with the Finnish schools and institutions, Finnish education authorities to utilize research-based methods in teaching and learning in Finland, and serves as a national hub in its research field. The centre is developing the #1 digital learning platform in Finland: ViLLE – the collaborative education tool. The system is utilized by more than 300 000 students, 14000 teachers, and 50% of schools an institutions in Finland. Students are conducting more than 150 000 000 tasks with immediate feedback annually.

Firstly, the presentation starts with short introduction to the Learning Analytics. Secondly, case examples of successful utilization of Learning analytics from different education levels are are presented. For example, Digital learning path in Mathematics education emphasizes active learning, gamification, and learning analytics. The student are utilizing one digital lesson in a week with interactive exercises with homework, in which we can automatically identify student typical errors. Thirdly, university level analytics case studies from from course level to year level. We can identify struggling student early in the courses. Utilizing this systematic collection of multifaceted data we were able to identify bottle-necks in your studies and create targeted interventions. The final part of the presentation is focusing on principles of developing research-based & data-driven Teaching and Learning ecosystem at large scale, and conclusion are drawn.

Keynote Speaker Minna Huotilainen

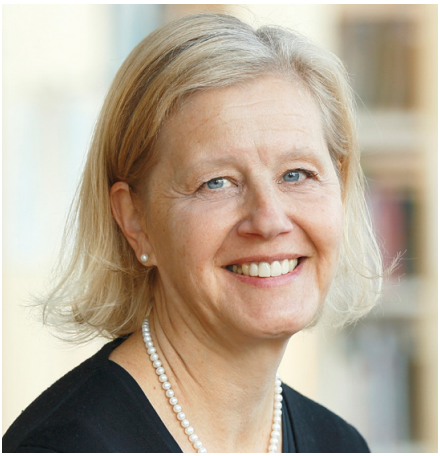
Professor of educational sciences

Faculty of Educational Sciences

University of Helsinki, Finland

Well-learning – Changing Education with Perspectives from Well-being and E-learning

Neuroscience can offer new insight into developing education and reacting to the changing world around us. The use of technology, be it in learning or in the society as a whole, is affecting the way that we encounter information, learn, develop ideas, and interact with each other. Studying the activation patterns of the brain can help us understand the multitude of effects that the use of technology has on learning and wellbeing. A combined view of learning and wellbeing - well-learning - will be drafted on the basis of recent knowledge on how choices made in planning education can affect the way that pupils and students can learn. This view is multimethodological, combining understanding from neuroscience and learning sciences but also from societal and wider perspectives.



Keynote Speaker Katariina Salmela-Aro

Academy Professor

Professor of Educational Sciences and Psychology

University of Helsinki, Finland

Visiting Professor Institute of Education University College London and Michigan State University

Digitalization, Learning and Resilience

This keynote will address interrelated topics of digitalization, learning and resilience. Digitalization offers young people both opportunities and risks. New findings how young people use digital tools, what are their key digital competences, and how these are related to their wellbeing are presented based on the new Youth Skills EU Horizon2020 program. Key questions are how digitalization can promote and prevent young people's wellbeing? What are the roles of digital resilience and digital parenting? How digitalization can promote student engagement and prevent burnout?

Interactive Panel by Funzi Mobile Talks

SDGs, Digitalization and Learning

Mobile talks event is an informal panel discussion between world-leading experts and learning advocates. The event is hosted by a Finnish Mobile learning company Funzi. Funzi's mission is to provide learning opportunities to those lacking access to formal education or skills development - the other 90 % of the world's population. Funzi courses are designed for young adults in emerging markets in need of critical 21st century skills. This event focuses on Sustainable Development Goals, digitalization, and learning. The discussion points address digital equity, mobile learning opportunities, and the prospects inclusive technologies provide for the youth in emerging markets.

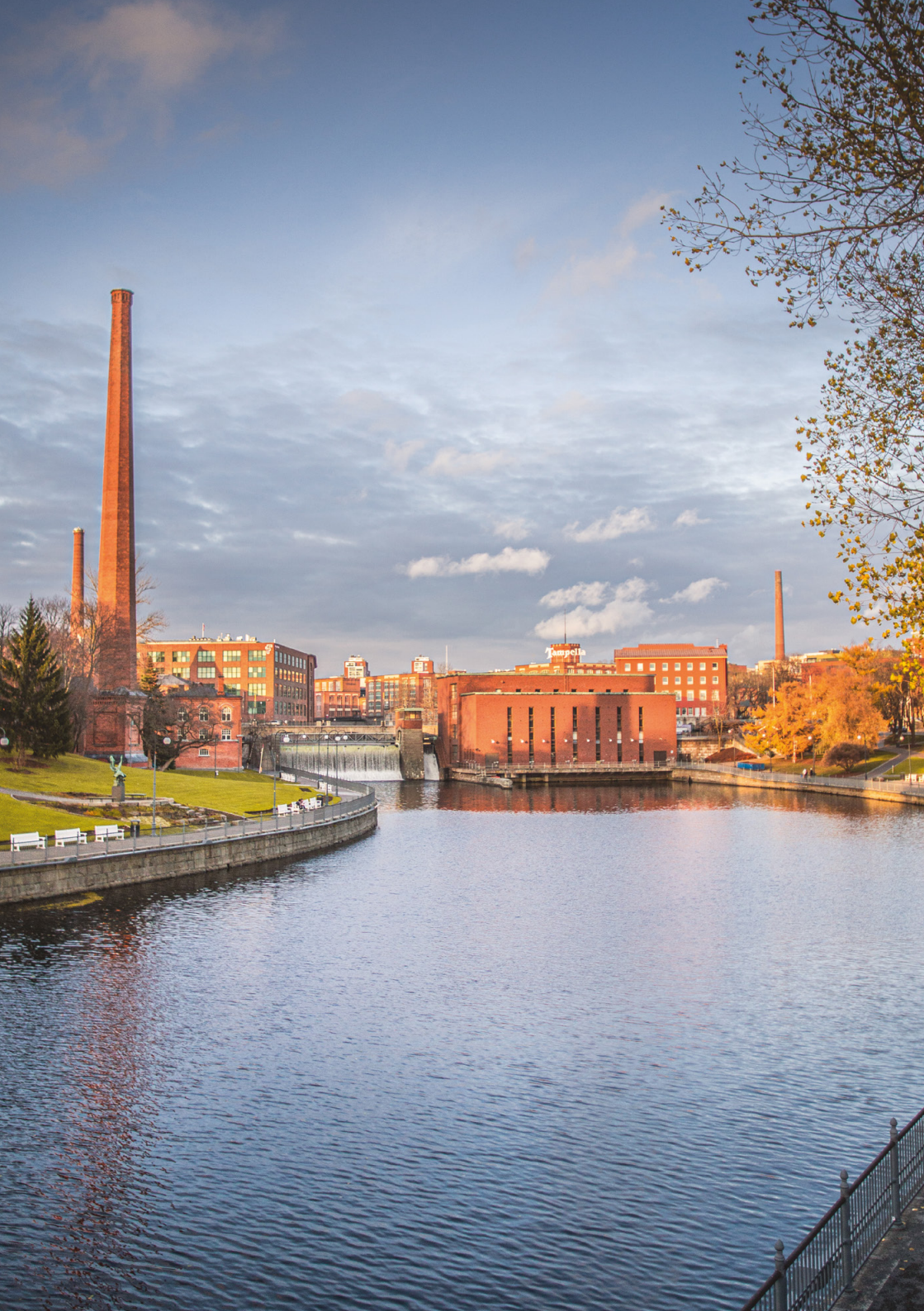
The panelists represent the United Nations, educational institutions, non-profit organizations, and mobile learning experts. The discussion enables examining different viewpoints around the topic and sharing new ideas.

Professor Samuel John
Director and Professor of the Department of Mechanical and Marine Engineering Namibia University of Science and Technology.

Mr. Reynald Maelda
Secretary-General at United Nations Tanzania.

Aviwe Funani
Programme, Policy, and Advocacy Manager at Waves for Change Cape Town, South Africa.

Aape Pohjavirta
The Founder and President of Funzi.


Tampella

CONFERENCE PROGRAM

Tuesday 17.8.	Wednesday 18.8.	Thursday 19.8.	Friday 20.8.
	08:30-09:00 Session 4.1: Demonstration	08:30-09:00 Session 7.1: Demonstration	
09:00-9:30 Registration (on-site) and Coffee (on-site & at Virtual café)	09:00-9:30 Coffee (on-site & at Virtual café)	09:00-9:30 Coffee (on-site & at Virtual café)	09:00-10:30 Parallel symposia Session 10.1: Symposium Session 10.2: Symposium
09:30-10:30 Opening of the Conference (on-site & live stream)	09:30-11:00 Keynote & discussion: Minna Huotilainen (on-site & live stream)	09:30-10:30 Parallel sessions Session 8.1: Vocational Education Session 8.2: Symposium	
10:30-12:00 Keynote & discussion: Mikko-Jussi Laakso (on-site & live stream)	11:00-12:00 Parallel sessions Session 4.2: Computer Science Education Session 4.3: History	10:30-12:00 Parallel sessions Session 9.1: Digitalization & Learning Session 9.2: Smart Agriculture Education	10:30-11:00 Coffee (on-site & Virtual café)
	11:30-12:00 Meet the Editors		11:00-12:00 Annual Meetings WG 3.4 & 3.7.
12:00-13:30 Lunch break	12:00-13:30 Lunch break	12:00-13:30 Lunch break	12:00-12:30 Closing of the Conference
			12:30- Lunch
13:30-15:00 Parallel sessions Session 1.1: Teacher Education Session 1.2: Inclusion & Digitalization	13:30-15:00 Keynote & discussion: Katariina Salmela-Aro (on-site & live stream)	13:30-15:00 Interactive panel on SDGs, Digitalization, and Learning by Funzi Mobile Talks @ OCCE (virtual)	
15:00-15:30 Coffee (on-site & Virtual café)	15:00-15:30 Coffee (on-site & Virtual café)	15:00-15:30 Coffee (on-site & Virtual café)	
15:30-17:00 Parallel sessions Session 2.1: Symposium Session 2.2: Python • Online Q&A Keynote Mikko-Jussi Laakso	15:30-17:00 Parallel sessions Session 5.1: Games Session 5.2: Symposium • Online Q&A Keynote Minna Huotilainen	15:30- Social program: Excursion (TBC) (on-site)	
17:00-18:00 Parallel sessions Session 3.1: Symposium Session 3.2: Demonstration	17:00-18:00 Session 6.1: Symposium • Online Q&A Keynote Katariina Salmela-Aro		
19:00- Social program: City of Tampere reception (on-site)	19:30- Social program: Conference Dinner (on-site)		All times are local times in Finland (EEST, UTC +3).

SESSION OUTLINE

#	Theme	Paper	
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		26	Primary Education Student Teachers' Perceptions of Computational Thinking through Bebras tasks
		11	What Kind of E-assessment Feedback Is Important to Students? An Empirical Study
1.2	Inclusion and Digitalization	12	Developing inclusive digital pedagogies. Reflections on the past, the present and future directions.
		28	Arguing the function of educational support on learning digital technology for socially disadvantaged youths in developed countries: How could the support function to improve their human development?
		10	PEDAGOGICAL ARCHITECTURE AP_PDF (Think Digital and Make): A proof of concept on Digital teaching in Portugal, disruptive to a new cycle
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2.2	Python	2	"Literacy from Python" Using Python for creative writing
		9	Starter Projects in Python Programming Classes
3.1	Symposium	39	Thinking Mathematically: The Present Transformational Digital Education as Challenged by Covid-19 Pandemic
3.2	Demonstrations	32	Making people work skillfully together with the support of the TeamFluent tool
4.1	Demonstrations	21	Design of Social Media Simulator for a New Course of Media Literacy in Japan
		31	IPSJ MOOC -- Video Materials in the Informatics Education in Japan
4.2	Computer Science Education	5	Development of IPSJ Data Science Curriculum Standard
		14	A Closer Look at and Confirmation of the General and Study Interests of Future Computer Science Students
		37	Teaching Agile to Generation Z students: Opportunities and Challenges
4.3	History	15	Computer Education in Australia Fifty Years Ago
		20	Digital Transformation of Education and Learning through Information Technology in Educational Management
		23	On Using, Teaching and Selection of Research Methods in Information System

	Michael Beißwenger, Swantje Borukhovich-Weis, Torsten Brinda, Björn Bulizek, Veronika Burovikhina, Katharina Cyra, Inga Gryl and David Tobinski	Full paper
	Miroslava Černochová and Hasan Selcuk	Full paper
	Djordje Kadijevich, Danijela Ljubojevic and Nikoleta Gutvajn	Full paper
	Sue Cranmer and Cathy Lewin	Full paper
	Tsohinori Saito	Full paper
	António Castro, Rui Trindade and Teresa Pereira	Full paper
	Issifu Yidana, Ephrem Kwaku Kwaa Aidoo and Benjamin Ghansah	Symposium
	Lawrence Williams and Beth Mead	Full paper
	Michael Weigend	Full paper
	Peter Akayuure, Michael Johnson Nabie and Kolawole Raheem	Symposium
	Minna Lakkala, Philip Dexter, Jukka Rautiainen, Tomi Männistö and Auli Toom	Demonstration
	Atsushi Hikita, Tomohiro Inagaki and Shota Tajima	Demonstration
	Takeo Tatsumi	Demonstration
	Tetsuro Kakeshita, Kazuo Ishii, Yoshiharu Ishikawa, Hitoshi Matsubara, Yutaka Matsuo, Tsuyoshi Murata, Miyuki Nakano, Takako Nakatani, Haruhiko Okumura, Naoko Takahashi, Norimitsu Takahashi, Gyo Uchida, Eriko Uematsu, Hiroshi Kato and Satoshi Saeki	Full paper
	Corinna Mößlacher, Max Kesselbacher and Andreas Bollin	Full paper
	Xiaofeng Wang, Ilenia Fronza and Tommi Mikkonen	Full paper
	Arthur Tatnall	Full paper
	Javier Osorio and Monica Banzato	Full paper
	Pertti Järvinen	Full paper

SESSION OUTLINE

#	Theme	Paper	
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		34	Students' Conceptions of Programming in the Context of Game
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5.2	Curricula in Schools	13	Symposium: Moving on with informatics/computer science curricula – challenges and opportunities
6.1	Symposium	40	The Migration to Remote Teaching and Learning at the University of KwaZulu-Natal (UKZN) during COVID-19
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		18	A Modern Curriculum Plan for Artificial Intelligence Based on Deep Learning
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		3	Vocational education during school shutdown - a Danish case focusing on emergency remote teaching
		4	AsTRA -- An Assessment Tool for Recognition and Adaptation of Prior Professional Experience and Vocational Training
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		38	The Role of Students' Evaluation to Promote Quality Assurance in Zanzibar Higher Learning Institutions Using Digital Tools
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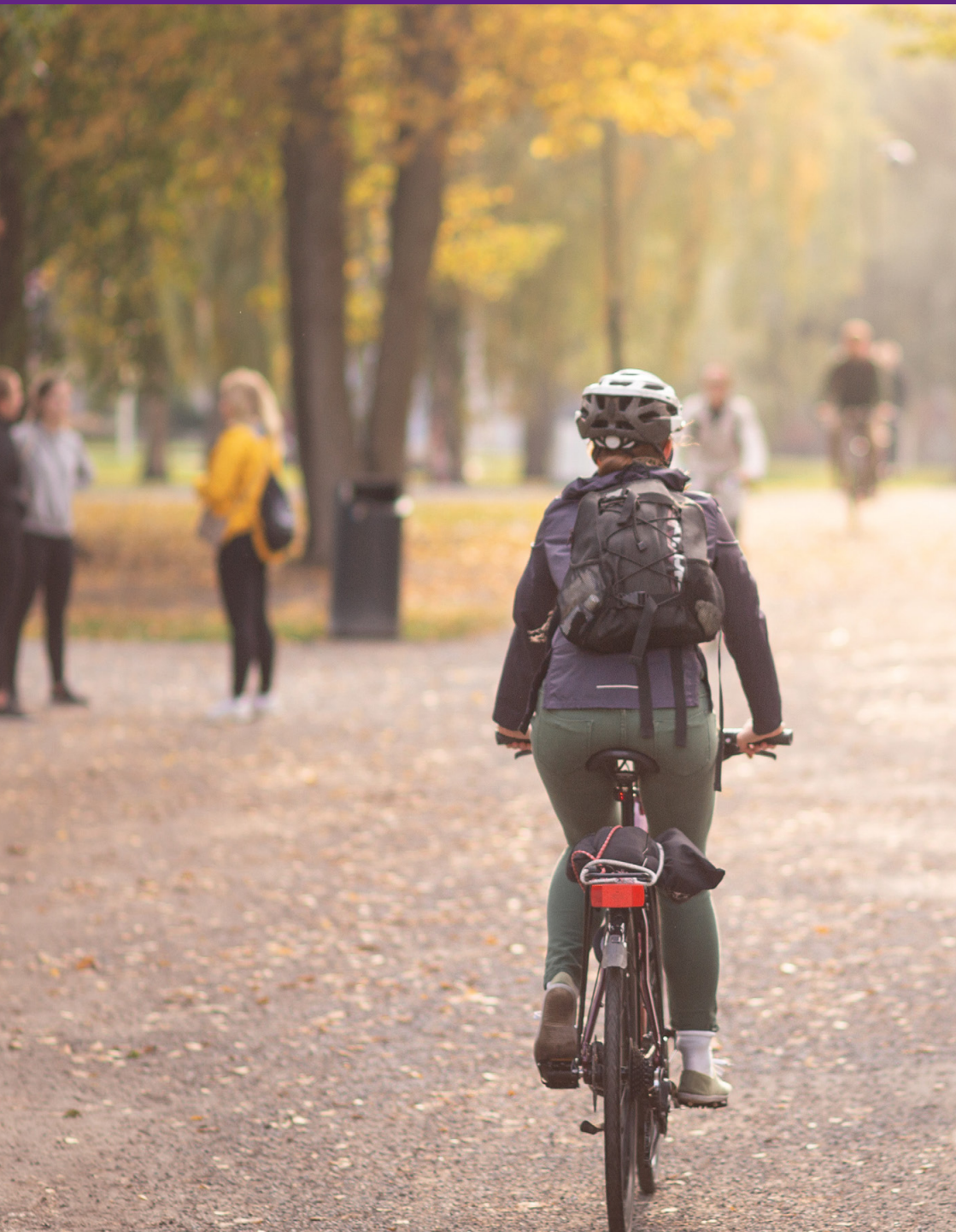
		33	DigiFit4All - Conceptualization of a Platform to Generate Personalized Open Online Courses (POOCs)
		35	Pandemic Education: Lessons Learned
9.2	Smart Agriculture Education	30	Needs and development guidelines for implementing Smart Agriculture and Entrepreneurship in UAS Dharwad, Karnataka, India
		7	Educational programme for climate change adaptation for food and water security: an agricultural, social science, business and information technology perspective
10.1	History	25	Symposium: "Celebrating 50 years of IFIP WG3.4 - Past and present of IFIP WG 3.4 - looking for future"
10.2	Curricula in Schools	13	Symposium: Moving on with informatics/computer science curricula – challenges and opportunities

	Erkki Rötkönen, Calkin Suero Montero, Nicolas Pope and Erkki Sutinen	Full paper
	Fatma Batur and Torsten Brinda	Full paper
	Margaret Leahy, Deirdre Butler, Hsiao-Ping Hsu and Denis Moynihan	Full paper
	Mary Webb, Andrew Fluck, Amina Charania, Peter Micheuz, Ivan Kalas, Maciej Syslo, Johannes Magenheim, Joyce Malyn-smith, Kathryn MacCallum and Charoula Angeli	Symposium
	Sadhana Manik, Bheki Khoza and Samukelisiwe Khumalo	Symposium
	Keiji Emi and Shigeru Okada	Demonstration
	Keiji Emi	Demonstration
	Seiichiro Aoki, Shinzo Kobayashi, Takahiko Naraki and Toshio Okamoto	Short paper
	Bent B. Andresen	Full paper
	Simone Opel, Cajus Marian Netzer and Jörg Desel	Full paper
	Maryam Jaffar Ismail, Hassan Ali and Said A.S Yunus	Symposium
	Said A.S Yunus, Maryam Jaffar Ismail and Iddi A Iddi	Symposium
	Katriina Vartiainen	Full paper
	Stefan Pasterk, Lukas Pagitz, Albin Weiss and Andreas Bollin	Full paper
	R. Robert Gajewski	Short paper
	Mahadev Chetti, Ashalatha K V and Shrishail Dolli	Symposium
	Nicholas Mavengere and Shepard Pondiwa	Short paper
	Mikko Ruohonen, Jaana Holvikivi and Nicholas Mavengere	Symposium
	Mary Webb, Andrew Fluck, Amina Charania, Peter Micheuz, Ivan Kalas, Maciej Syslo, Johannes Magenheim, Joyce Malyn-smith, Kathryn MacCallum and Charoula Angeli	Symposium

PAPER ABSTRACTS



Session 1.1
Teacher Education

An Integrated Model of Digitalization-Related Competencies in Teacher Education

Michael Beißwenger[1], Swantje Borukhovich-Weis[1], Torsten Brinda[1], Björn Bulizek[1], Veronika Burovikhina[1], Katharina Cyra[1], and David Tobinski[1]

[1] University of Duisburg-Essen, Essen, Germany

Abstract. This paper presents a model of digitalization-related competencies for teacher education, developed by a working group on digitalization in teacher education at (WG DidL) at the University of Duisburg-Essen. Currently, there are various models and descriptive matrixes available that outline the competencies teachers should develop for being equipped to work in a digital world. These approaches often mention various, widely applicable digitalization-related skills and competences that teachers are meant to acquire, or they are based on a limited or only implicit understanding of digitalization. The aim of the model presented in this paper is to contribute to the discussion of how to best integrate existing models. It is based on an integrated understanding of digitalization-related competencies that encompass teaching and learning with digital media, as well as learning about digitalization as a subject matter in its own right. At the center of the model are generally formulated competency goals for teaching and learning, for professional engagement, and for reflective, critical-constructive teaching practice. The potential for achieving these goals is then illustrated by means of interdisciplinary and/or subject-specific examples. In this way, the model can also be applied to specific subject areas and to their teaching methodologies.

Keywords: Digitalization-related Competencies, Teacher Education, Frameworks of Digital Competence, Reference Models

Primary Education Student Teachers' Perceptions of Computational Thinking through Bebras tasks

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Abstract. This paper describes an investigation of primary education student teachers' perceptions of computational thinking (CT) who participated in a course 'Digital Technologies in Primary Education' and explores what these students consider difficult when developing primary school pupils' CT. In the academic year, 2021/22, a revised curriculum will be introduced into Czech primary school education. Instead of 'ICT', which has so far been taught in primary education, 'Informatics' is to be introduced into the curriculum as a new subject at all school levels. In this regard, pupils' digital literacy will be formed and developed across all subjects. Therefore, all faculties of education in the Czech Republic have paid great attention to the development of CT of primary education student teachers to prepare them for the planned changes in school practice. Using qualitative methods, the study findings among N=66 primary education student teachers (who analysed the Bebras contest for primary school pupils) were that (1) for better understanding of CT, student teachers are required to have sufficient Informatics knowledge to be able to think computationally, (2) student teachers reported CT is close to mathematical thinking, but these two concepts are not the same, and (3) CT development in primary education requires logical thinking, reading literacy and counting abilities.

Keywords: Primary School Student Teacher, Computational Thinking, Informatics in Education, Bebras contest.

What Kind of E-assessment Feedback Is Important to Students? An Empirical Study

Djordje M. Kadijevich[1] , Danijela Ljubojevic[2] and Nikoleta Gutvajn[1]

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Abstract. E-assessment needs to provide detailed feedback that students would actually use. To this end, the content of feedback should include assessment information that is important to students. By using a convenient sample of twenty second-year undergraduate students, this study explored the extent to which different kinds of assessment feedback were important to students. Therefore, an online questionnaire was administered which, apart from asking values of some background variables including academic achievement, listed a number of different feedback techniques supporting activities applied in deep and strategic approaches to learning and studying. For each technique, students had to indicate the extent of the importance they assigned to it. It was found that: (1) although feedback techniques supporting a deep approach were equally important to students as those supporting a strategic approach, the importance of the former was positively related to that of the latter; (2) feedback techniques supporting a deep approach were more important to females than males; (3) when the importance of all these feedback techniques together was considered in a specific way, their relevance to increase in students knowledge, skills and motivation could be demonstrated. Although this study used a small sample that might characterize it as preliminary research, it revealed valuable findings, which due to their considerable effect size, make the sample size less questionable. Suggestions for further research are included.

Keywords: E-Assessment, Feedback, Language Learning, Learning Approach, Undergraduate Students.

Session 1.2
Inclusion and Digitalization

Developing inclusive digital pedagogies. Reflections on the past, the present and future directions

Sue Cranmer[1] and Cathy Lewin[2]

[1] Lancaster University
[2] Manchester Metropolitan University

Abstract. Disabled children's experiences of using digital technologies in mainstream classrooms are very mixed. On the one hand, children's rights and digital rights legislation and inclusive education policies have promoted inclusive and equitable pedagogical practices for decades. Digital technologies are becoming increasingly prevalent in homes and schools, a phenomena rapidly accelerated by the global Covid-19 pandemic. Despite this positive rhetoric, the reality on the ground is that inclusive digital pedagogies – that prevent disabled children experiencing exclusionary educational practices in mainstream classrooms – are underdeveloped and require significant research and development. Current uses of digital technologies by disabled children, harnessing accessibility features in mobile technologies, can focus attention on their differences. Digital technologies in classrooms generally are often used in mundane ways which do not make the most of opportunities for creativity, collaboration and student-centred learning. This paper reflects on the situation in the past and present in relation to the impact of disability studies, children's rights, policies on inclusive education and, digital technology developments and educational practices, on the development of inclusive digital pedagogies. It concludes by outlining a research project involving two schools in North West England in order to identify good practice, success factors and challenges in relation to the development and implementation of inclusive digital pedagogies.

Keywords: Disabled children; Inclusion; Digital pedagogies; SEND; Digital technologies; Learning; Education.

Arguing the function of educational support on learning digital technology for socially disadvantaged youths in developed countries: How could the support function to improve their human development?

Toshinori Saito

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Abstract. This paper discusses a study into the function of educational support on learning digital technology for socially disadvantaged youths living in developed countries, focusing on how such educational support could help their human development as digital citizens. Based on the focus, the author joined a support group activity for disadvantaged youths and engaged in helping their learning of computing skills and knowledge. The author found that: 1. autonomous participation in learning computing skills and knowledge was found among the youths; 2. computer programming led the youths to find the joy of thinking computationally; 3. the youths learned more actively when the author behaved as a co-learner rather than a teacher; 4. computing capacities enlarged the youths' expected roles in the group. Based on these findings, the author concluded that such educational support could help disadvantaged youths' human development in such meanings as 1. expanding their freedom to explore digital technology by themselves; 2. stimulating their self-determining attitudes as active learners in a digital environment; 3. expanding their space of participation into a digital society. The study results suggest a need for inclusive educational support for socially disadvantaged people in local communities of developed countries in terms of skills and knowledge of digital technology and the capability to learn digital technology by themselves.

Keywords: Digital citizens, Educational support, Human development, ICT4D.

PEDAGOGICAL ARCHITECTURE AP_PDF (Think Digital and Make): A proof of concept on Digital teaching in Portugal, disruptive to a new cycle

António Castro[1][0000-0001-9892-5957], Rui Trindade[2][0000-0001-8740-5382] and Teresa Pereira[3][0000-0001-4556-9578]

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[3] ISEP, Politécnico do Porto, Portugal

Abstract. The work suggested here aggregates and adds value in the way it adapts teaching Digital in a contemporary pedagogical configuration, structured and connected. Under the principles of teaching Digital from the understanding of its functioning, the work was developed as a proof of concept and is based on an epistemological valuation of knowledge, thus, on the pedagogical side and on the computing side as well. But first, the designation of Digital used in this domain was visited trying to clarify the terminology 'Digital', as it is herein assumed 'Digital' as a substantive, as a body. This epistemological valuation aligns the work to teach the Digital from the understanding of how it works, why exists, what difficulties were overcome and why affirm by these times; whether planning and practices of the preparation of how to teach that it comes from the body of knowledge of pedagogies, as well as in the panning and practices of what to teach towards to the Digital, from an early age through the twelve years of schooling. This allows us trying to educate technology producers rather than technology consumers. The work intervenes in structuring pedagogical dimensions of the teaching of Digital, intervening in (i) the dogmatic pedagogical paradigm of how to teach from the understanding of how it works, but also in (ii) in learning spaces, in (iv) teacher training and the clarification of a (v) feedback structure for the learning's. The epistemologies fundamentals are considered to be structuring in this way of teaching to the Digital and have the particular characteristic of being constructed in a disruptive way by visiting its foundations. The development of the proof of concept was built in a scientific and methodological iterative process that culminates in evidence of architecture configuration, with a heritage of information, instruments, procedures, and attitudes.

Keywords. Pedagogical Architecture, Digital Teaching, Digital, Pedagogical Communication Paradigm

Symposium 2.1
Education in African Higher Learning Institution: The present Transformational Digital Education as challenged by Covid-19 Pandemic

Education in African Higher Learning Institution: Teacher Education Challenges

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Abstract. The University of Education Winneba (UEW) is the leader in teacher education and educator development in Ghana. Charged with the responsibility to train competent professional teachers for all levels of education, as well as to conduct research, disseminate knowledge, and contribute to educational policy and development, the university plays a leading role in the country's drive to produce scholars whose knowledge would be fully responsive to the realities and exigencies of contemporary Ghana and the West African sub-region in the 21st century. The outbreak of the COVID-19 pandemic has imposed unimaginable challenges on higher education institutions globally. Ghana recorded its first case of the coronavirus on March 12, 2020. Consequently, the government had to put in place a series of measures to slow the spread of the virus in the country which included the lockdown of all educational institutions. This directive interrupted the academic calendar of all universities and the UEW had to find innovative ways of addressing the challenges imposed by the COVID-19 Pandemic in order to bring the academic year to a successful end. UEW pioneered technology enabled instructional delivery and learning in the tertiary education space in Ghana in 2012 but was not able to sustain its implementation. A Project Sponsored by the Partnership for Higher Education in Africa Educational Technology Initiative (PHEA ETI) on Using MOODLE for Teaching and Learning at University of Education, Winneba by Yidana, Sarfo, Edwards, Boison, and Wilson (2013) showed that prior to the implementation of the PHEA ETI, UEW had not institutionalized the use of LMS, though the University in the past mounted three courses for online delivery on MOODLE. These courses were developed externally by a South African organization, eDegree. However, Academics of the UEW were not involved in the design and development of these courses and were only involved in facilitating the courses after their development for distance learners. This resulted in the abrupt implementation of the programme and the UEW was caught unprepared when the COVID 19 pandemic struck. From March 15 to July 31 2020, UEW resorted to online instruction and assessments to complete academic work for the second semester of the 2019/2020 academic year. Though it was ad hoc, UEW engaged over 400 faculty and 92,000 students in remote learning activities and interactions, using MOODLE LMS and other social media Apps. This aim of the study is in three folds, first, to find out and evaluate exactly how courses are being developed online. Second, to evaluate the university's directive to use Hybrid Mode of instructional delivery being implemented, thus matching what is been practised against what is the standards. Finally to identify deficiencies and suggest ways to address those deficiencies so that the hybrid mode of instructional delivery could be conducted more effectively.

Keywords: COVID-19 Pandemic, Learning Management System, Digital Learning, Online Learning.

Yidana, I., Sarfo, F. K., Edwards, A. K., Boison, R., & Wilson, O. A. (2013). Using the Moodle learning management system for teaching and learning at the University of Education, Winneba. Unlocking the potential of ICT in higher education: Case studies of educational technology initiatives at African universities, 58-75

Digital transformation and learning in Higher Education in Africa: An analysis of Institutional ICT Policies

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Abstract. Educational Technology (ET) policies and plans provide institutions with clear guidance and directions and strategies in the implementation of ET initiatives and other technology solutions. The history of ICT Strategic Plan for the University of Education, Winneba (UEW) can be traced back to 2003. In order to institutionalize the ET Initiative, the University was to put in place the necessary structures, strategies and policies that will guide the University's use of ET to modernize its educational delivery. However, between the years 2003-2008, the UEW failed to implement the strategy and experimented with mass technology training which resulted in massive failure in impacting on student learning and academics' practices. Consequently, in 2011, a team led by the Head of Information and communication Technology Education Department formulated an ICT policy that sort to rekindle the principles that underpin earlier UEW's educational technology initiative and also how to implement the set principles, with the understanding that effective use of technology can make a positive difference in the quality of teaching and learning, and increase student performance. The ICT policy was developed together with an ET plan, to guide and facilitate the University's technology planning, funding, implementation, and evaluation. It was to guide the University to promote technology access, use, professional development, and partnerships. It was also to guide the University to address technology and digital age literacy, problem solving, creativity, effective communication, collaboration, and high productivity skills essential for the e-learning community in a rapidly changing global educational landscape and economy. Finally, it outlined guidelines and standards to guide users and decision makers in the development and use of ICT Resources provided by The University of Education, Winneba to University students, employees, and authorized affiliates. It's been over a decade since the draft ICT policy was submitted to management of the UEW for approval and implementation. The purpose of this research is to investigate what informed the existing policies (i.e. the ET, ICT and Online policies), how far they have been implemented, what bottlenecks are there in their implementation and the way forward. The outcome of this study will inform policy revisions to make it more digital compliant and also reflect the current need for hybrid mode of learning and also cope with the challenges of large student numbers. The study will employ qualitative methodology involving document analysis and interviews.

Keywords: COVID-19 Pandemic, ICT policy, Digital Learning, Online Learning.

Digital Transformation and Learning in Higher Education in Africa: Infrastructural Readiness and Challenges

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Abstract. In line with the World Health Organisation (WHO) declaration of the novel Coronavirus 2019 (COVID-19) as a pandemic, and the ministry of education in Ghana directed all Educational Institutions to take precautionary measures against the pandemic. These required the curtailment of various activities including the congregation of people. This meant that teaching and learning activities could not be continued in a face-to-face mode as usual. The alternative was to embark on online learning as had been adopted in many parts of the world through digital transformation. The University of Education, Winneba at the start of the COVID 19 pandemic had a functional Learning Management System using Moodle. The use of MOODLE was explored in a limited scope in a funded project, Partnership for Higher Education in Africa Educational Technology Initiative PHEA-ETI, from 2010 to 2013. Lecturers from a few academic departments, who can be categorized as early adopters continued to patronize the MOODLE to date. However, the use of the MOODLE had not been institutionalized until the advent of the COVID-19 pandemic. Consequently the system had not been fully tested with large numbers of courses and students enrolment hence with the urgent move to full online learning, various challenges arose. Currently the university has a policy on running its programme on a hybrid mode of instructional delivery. The study therefore examines the eLearning readiness of the University of Education, Winneba in terms of required technology infrastructure to ensure smooth delivery of teaching and learning online. It aims to identify any deficit that might exist and to explore ways that the University can make up for the deficits. It examines the technology environment both within the University of Education, Winneba and outside the university to understand the contextual factors that affects the implementation of eLearning. The Infrastructure and Operations teams, broadly responsible for the administration and management of the University's eLearning technologies were interviewed to understand the nature and adequacies of technology resources like processing power, networking, storage, data and software among others. Information on how these resources were aligned to each other to deliver a satisfactory teaching and learning service was also collected.

Keywords: COVID-19 pandemic, Learning Management System, Digital Learning, Online Learning, Technological Readiness, Technology Infrastructure

Session 2.2
Python

“Literacy from Python”
Using Python for cross-curricular teaching and learning

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Abstract. This introductory computer programming project, using Python, builds on the success of the Literacy from Scratch computing model (Note 1), and other creative teaching materials. It encourages the development of elementary computer programming skills by pupils aged from 10 to 14 years, through the creation of short stories, using Python. Each story chapter of the project also introduces a new Python programming element such as graphics and times-tables (Note 2), within the constructionist framework of a creative writing project. To ensure that the project was manageable for the classroom teachers who might wish to adopt it, all of the Python programming, was written or modified by an 11-year-old UK student.

Keywords: Python, Scratch, Story-Telling, Cross-Curricular Work, Creativity.

Starter Projects in Python Programming Classes

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Abstract. Starter projects are a facet of constructionist learning arrangements (Papert, Resnick). The term “starter project” was mainly coined by the Scratch community and means a simple, executable program that is designed to encourage copying, exploring and further development. A starter project serves as the seed of a tinkering process. This contribution first discusses three types of starter projects: 1) A test program demonstrates that the mechanics of program execution work. 2) An example illustrates certain programming techniques and algorithms. It can be designed to initiate specific types of creative activities, like improving a program of low performance, extending the functionality or transferring a code pattern to a completely new domain. 3) An architectural prototype is a program that is syntactically correct but is functionally incomplete. It helps to start a development process by giving a basic architecture and thus reducing cognitive load. The article presents self-observations of university students, who have attended an introductory Python class at the University of Münster, describing how they used starter projects for learning. The students reported how they processed the given program code, what kind of learning activities they performed and what kind of creative design activities they preferred when working with starter projects.

Symposium 3.1
Thinking Mathematically: The Present Transformational Digital Education as Challenged by Covid-19 Pandemic

Learning Mathematics in the Digital Age: Challenges Caused by Covid-19 Pandemic Arrangement in University of Education, Winneba

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Abstract. Science and Mathematics education have always thrived in face-to-face lecture spaces across most educational institutions in Ghana. However, for the past one-half years, this has been leveraged by the emergence of digital technologies and the onset of the covid-19 pandemic. In the University of Education, Winneba (UEW) for example, instructional delivery is rapidly transforming given way to new and innovative ways of education delivery. One academic discipline, among others, challenged with the advent of Covid-19 and digital education is Mathematics. It appears the advent of Covid-19 has transformed the utilitarian roles of mathematics education and in particular, the application of the mathematical concepts such as social distancing, circle of convergence and spread of distribution of human beings. Within the challenges caused by Covid-19 pandemic in UEW, this paper raises questions regarding how the present digital education affects or promotes UEW Mathematics students' thinking mathematically; what mathematics thinking will influence generational thinking about the global education and how mathematics educators and researchers through digital transformation can provide solutions to enhance instructional delivery and research.

Keywords: UEW, Covid-19, Mathematics and Science Education, digital transformational challenges, LMS.

Use of Vclass in Mathematics Education Delivery: The UEW Experience

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Abstract. The advent of the Coronavirus pandemic (Covid-19) has rapidly influenced every domain of human existence and drifted human undertakings to a new normal in which social distancing becomes the norm. With the emergence of the new normal, educational institutions worldwide are beset with teaching, assessment and learning sustainability crises. These crises compelled many educational managers and lecturers to rethink about educational access and delivery while students strive to adjust to new learning systems external to the orthodox face-to-face mode. The questions of which and how learning platforms can be used for educational delivery remain unsettled. In spite of this, institutions of higher learning are quickly adapting to the crises. In developing countries like Ghana, new and emerging digital learning platforms, assessment modalities and delivery modes are being experimented in schools without prior evidences of their effectiveness, successes and shortfalls. For the past one and half years for example, there has been unprecedented push to online teaching, learning and assessment with commercial digital learning platform providers also on the rush to provide support and solutions to educational delivery, sometimes for free. The University of Education Winneba (UEW) trains competent professional teachers for all levels of education in Ghana and the West African sub-region. When Ghana recorded its first case of the Covid-19 in March 12, 2020, culminating to lockdowns and closure of all institutions, the academic calendar was disrupted. UEW was then compelled to device innovative ways of using Learning Management Systems (LMS) called vclass to enable students learn amidst the pandemic to bring the 2019/2020 academic year to a successful close. Following this, the struggle to sustain the new innovation of using the UEWvclass for educational delivery in UEW comes with new dilemmas and contextual issues of ICT infrastructures, faculty capacity and students' support and welfare. This paper mirrors students and their lecturers' experiences in the use of UEWvclass platform to learn various courses in mathematics education in UEW. Notwithstanding a number of exciting experiences conveyed as first time users of vclass, users are challenges with online course creation, online lesson delivery, e-assessment, digital skills and network connectivity. As a result of the covid-19 pandemic and digital experiences, UEW plans to emphasize, consolidate and serve as a pace setter of hybrid/blended instructional delivery for its regular, sandwich and distance modes beyond the Covid-19 era.

Keywords: Covid-19, Mathematics education, LMS, UEW vclass experience.

Demonstrations 3.2

Making people work skillfully together with the support of the TeamFluent tool

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Abstract. Collaboration skills and the mastery of teamwork practices are regarded as essential in the current world of work, study and everyday life. There is already a wealth of research-based knowledge available about the features that characterize a successful team, including a safe, encouraging and curious atmosphere, equal participation, active communication, constructive and respectful interaction, open sharing of information and listening to others, shared visions and goals, helping others, and acceptance of criticism and reflection (Hoegl & Gemuenden, 2001; Broussard, La Lopa & Ross-Davis, 2007; Decuyper, Dochy & Van den Bossche, 2010; West, 2014). Competencies related to interaction and collaboration are emphasized in curricula worldwide (Voogt et al., 2012), but educators lack pedagogical methods supporting them in educational settings (Lakkala et al., 2015). Similarly, in workplace contexts there is a need for methods and instruments that enable the evaluation and improvement of team performance seamlessly integrated into existing group work practices. In the demonstration, we will introduce a digital solution, TeamFluent (https://www.teamfluent.eu/), as a research-based tool for educators, team leaders and team facilitators to promote the evaluation and improvement of collaboration practices in teams as part of daily work. TeamFluent is a modular, web-based survey instrument that can be used a single time or repeatedly for self- and co-reflection of one's own or the whole team's behavior contextually in collaboration situations. The facilitator can construct each survey flexibly tailored to the context by choosing the themes and perspectives according to the goals and needs of the team. The survey items and themes have been created through extensive empirical research and piloting. After responding, each respondent gets immediate feedback about their own results compared with the team averages, which is a good starting point for joint discussions. The facilitator can examine the results from multiple perspectives and can take up issues to be considered together related to the strengths and points for improvement in team behaviour and

practices. The demonstration includes the introduction of the design principles behind TeamFluent, a presentation of its main features and discussion about its possibilities in promoting the development of teamwork skills and practices in educational and workplace contexts.

Keywords: Teamwork, Collaboration, Digital Tool, Self-Evaluation.

Demonstrations 4.1

Design of Social Media Simulator for a New Course of Media Literacy in Japan

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Background. The purpose of this research is to equip students with media literacy of information dissemination through experiencing sharing with simulator. To study shares, it is necessary to consider the elements of conversation in social media communication". However, miscommunication often occurs due to differences in the interpretation of information. We design a simulator that we can have experiences of our daily action. We expect that it will be an opportunity to discuss the diversity of information interpretation and the risks of sharing ambiguous information in class.

Structure of Simulator. We have two basic criteria as, "Widely share correct information" and "Not share incorrect information". In addition, we add another criteria as, "Private sharing of information that is determined to be incorrect or even as a Joke". This is because, we also considered situations that may occur in daily life, from the perspective of communication with friends. The following table 1, we summarize examples of algorithm for increasing or decreasing the numbers of followers.

Table 1. Algorithm for the numbers of followers (x=numbers of followers)

Sharing	Not Fake News post	Fake News post as incorrect or Joke	Fake News post as Not Fake News
Public	x=x+3x	x=x+x/4	x=x-x/2
Private	x=x+2x	x=x+x/2	x=x-x/4
No Sharing	No change	No change	No change

We expect students to know the differences between their own and others' interpretations and to learn the diversity of interpretations.This game has been used in classes for first grade students in Hiroshima university since April 2021. The results and issues will be reported in the presentation.

Keywords: Media Literacy, Fake News, Share Literacy, Social Media.

IPSJ MOOC - Video Materials in the Informatics Education in Japan

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Abstract. In order to reach the level of informatics education in Japanese high schools to the level of other countries, we must incorporate programming and data analysis. The author, as a faculty member of the Open University of Japan, organized the team to produce eight video materials produced by the Informatics Processing Society of Japan. These videos are published as IPSJ MOOC on the YouTube IPSJ channel.

Keywords: Informatics Education, Secondary Education, MOOC.

Session 4.2
Computer Science Education

Development of IPSJ Data Science Curriculum Standard

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Abstract. The Information Processing Society of Japan (IPSJ) is working on curriculum standard development for university-level education majoring in data science. In this paper, we report on the curriculum standards. Data science education and the development of data scientists are recognized to be quite important in both social and business contexts. The IPSJ data science curriculum standard is developed considering various related initiatives and has the following unique features. (1) The DS curriculum standard covers a wide range of related fields to ensure international compatibility through mapping to the ACM Data Science curriculum and the European EDISON Data Science Framework. (2) It collaborates with the IPSJ Data Scientist certification (under development) by referring to the Data Scientist (DS) skill checklist (assistant level) developed by the Data Scientist Society of Japan. (3) It clarifies the knowledge and skills required of students majoring in data science. (4) It assigns a time to each educational content so that the curriculum size becomes approximately 675 class hours (60 credits in the Japanese credit system). (5) It collaborates with the Model Curriculum for Mathematics, Data Science and AI Education (Literacy) developed by the Japan Inter-University Consortium for Mathematics & Data Science, supported by the Japanese government.

Keywords: Data Science, Curriculum Development, Statistics, Artificial Intelligence, Computer Science, Data Management, Software Engineering, Data Scientist Certification.

A Closer Look at and Confirmation of the General and Study Interests of Future Computer Science Students

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Abstract. Many factors can indicate pupils' tendencies to be interested in specific fields of study in the future. Examples of such measures are personal interests, which can also evaluate and develop institutional programs and interventions that can support pupils' education in computer science. In this work, we report on a study to document characteristic profiles in general interests and study interests, surveying pupil cohorts that attend different activities related to computer science: workshops (compulsory and non-compulsory) and contests related to computer science. We match these interest profiles with the interests of first-semester students of computer science. Pupils attending computer science activities in their leisure time show similar or higher interests in study fields related to studying computer science than the students, differentiating them from pupils attending compulsory workshops. We also show that the relations between general interests and study interests are uniform for pupils and students, helping teachers and syllabus builders promote encouragement towards the interest in computer science.

Keywords: interests, k-12 education, STEM, student acquisition

Teaching Agile Methods to Generation Z Software Engineering Students: Opportunities and Challenges

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Abstract. While agile software development methods became a mainstream approach in industry, it has also featured as an important topic in the teaching offerings of many universities of which Generation Z students are the dominant population. However, what has necessitated the birth of agile methods may not be familiar for this new cohort of students, and what has challenged the agile methods adoption in companies may be taken for granted by the university students nowadays. This raises the need to rethink how to teach agile methods to Generation Z software engineering students. In this paper, based on a review of agile methods and their evolution, and the characteristics and learning styles of Generation Z students reported in the literature, we conjectured two opportunities and four challenges of teaching agile methods to the new generation of software engineering students. This conjecture serves as the starting point for empirical investigations which could lead to discovery and design of good practices to educate our future software professionals.

Keywords: Agile Software Development, Agile Methods, Generation Z, Software Engineering Education

Session 4.3
History

Computer Education in Australia Fifty Years Ago

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Abstract. This paper is about computer education in Australia fifty years ago when it was just at its beginning. It makes particular reference to the State of Victoria. The paper covers the period of the 1950s-1980s. It looks at how, after the first mainframe computers appeared, university courses in programming began in the 1950s and 1960s. In 1960 the Australian Commonwealth Government began looking for ways in which government departments could make use of computers and in 1963 set up the Programmers-in-Training scheme. This was later taken over by the Colleges of Advanced Education and became the template for many future business computing tertiary courses. Computing in schools made a minor start in the early 1970s with a few schools teaching programming in maths classes using punch cards that were run at a local university. Arrival of the low-priced microcomputer in the late 1970s changed the situation dramatically with many schools quickly making use of them in education. Initially this involved teaching about information technology, but in the later 1980s computers began to be used in other subject areas.

Keywords: Information technology, education, curriculum history, Australia.

Digital Transformation of Education and Learning through Information Technology in Educational Management

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Abstract. 2021 is a year of anniversaries in the IFIP family. IFIP TC3 WG3.7 is 25 years old. Celebrating anniversaries is a good opportunity to reflect on how far we have come and what the future holds. The incorporation of digital technology in education reflects an evolution of light and shadow, with many challenges for the future. Information technology has not only been present in the field of education as a teaching-learning tool, but has also played an important role in educational management. This paper analyses the contribution of IFIP TC3 WG3.7 to the development of the field of Information Technology in Educational Management. It contextualises its origins within the framework of the evolution of digital technology and analyses the most recent situation. The challenge for the future is to reflect on the possible contribution of contemporary educational management trends to help create a balance that facilitates the implementation of digital technologies in education while meeting the social objectives that give meaning to the educational system.

Keywords: information technology, educational management, WG3.7

On using and selecting of a research method in information systems

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Abstract. Every discipline must sometimes self-reflect its view. In Information Systems (IS) we have technical artifacts, human users, data and their combinations as objects of our studies. Because of a large variety of research objects both the worldviews pre-supposed and research methods selected play a central role of our discipline. Our purpose is to draw a big picture of IS research methods based on literature reviews. We shall show that the positivist perspective is still in the leading position but there are an increasing number of interpretive and critical studies. The survey method is the most common method followed by case study and laboratory experiment. For some perspectives, in a methodology literature, there is a need for improving and supplementing guidelines for certain methodologies. Based on old and new guidelines we develop a new basis for a selection of a research method. We have already taught university students during an era of journals in a paper form as an only outlet. Now journals also have an electronic form that can be utilized in teaching and learning. We demonstrate one way to do that, namely to prepare summaries of articles.

Keywords: Research Method, Guideline, Summary of Article (in the Finnish language).

Session 5.1
Games

Is It Real? – Learners' Perceptions on Teleimmersive 3D Video Technology and its further Use in K-12 Education

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Abstract. Current immersive technology applications, such as virtual- and augmented reality (VR/AR), are still limited in providing an immersive experience in which a user is perceived in 3 dimensions (3D) as their real self. Furthermore, research on such immersive environments applied to educational contexts is scarce. To investigate the unexplored opportunities of immersive technologies in education, we carried out a trial of our teleimmersive platform (TIP) with elementary school 6th grade learners (12-13 year-olds) working on an environmental study lesson. During our investigations, we applied qualitative analysis of the learners' focus group interview, researchers' field notes, and recordings of test sessions, alongside descriptive statistics of questionnaires. The learners expressed feelings of positive surprise and excitement, and felt the technology enabled their participation throughout the lesson. The learners recounted feelings of 'being there' inside the environment and in the company of the teacher. The learners agreed that their sense of physical proximity and presence inside the immersive environment is similar to that of face-to-face interaction with the teacher. With our investigations, the opportunities of this emerging technology towards boosting online educational activities for learners to develop their 21st century skills are highlighted. Our findings indicate that the introduced 3D TIP technology has the critical potential to overcome psychological strains due to physical distance in online education.

Keywords: Sense of presence, Immersive learning environments, 21C skills.

Students' Conceptions of Programming in the Context of Game Design

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Abstract. Several attempts have been made to understand novice programmers' difficulties and misconceptions in introductory programming. Most studies in the field of students' conceptions of (object-oriented) programming have only focused on identifying (mis-)conceptions without including popular contexts like game design. Since digital games are an important part of students' everyday lives, exploring students' conceptions of digital games and their programming may give some recognizable patterns which might be helpful for teaching. This paper presents a brief overview of an empirical qualitative pilot study with the aim to investigate undergraduate students' conceptions of (object-oriented) programming in the context of the game Tetris®. For this study we interviewed four students who were 19 to 21 years old and analyzed the transcripts using qualitative text analysis. Moreover, an online survey provided qualitative data from 25 participants. The first findings show that students' conceptions are based on the rules of the game and first indications about influence factors could be found. As a result of these investigations, implications were made for the future main study.

Keywords: Conceptions, Computer Science, Game Design, OOP, Digital Games, Programming, Qualitative Text Analysis.

Building Pre-Service Teachers' Confidence and Competence in Using Game-Based Learning

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Abstract. Findings from a study carried out by Butler et al (2020) indicated that that the design of pre-service teacher education programs in Game-Based Learning (GBL) should be short-term (at least one semester), include frequent exposure of gameplay experience, focus on at least two different genres of games and that it was sufficient to use one platform. Drawing on these findings, the authors designed and implemented a module on GBL with final year pre-service teachers in the Bachelor of Education programme in Dublin City University. A pre- and post- survey was conducted with the students to ascertain if confidence and competence in using GBL was impacted by the intervention. Both surveys were completed by 182 participants. Findings indicated that pre-service teachers who had played digital games at least once or were playing digital games had both significantly higher levels of pre-confidence and pre-competence com-pared to those who never play. Furthermore, female pre-service teachers had both significantly lower levels of pre-confidence and pre-competence than their male counterparts. As approximately 85% of each year group of pre-service teachers are female, the gender gap was of great concern to us. Following the intervention, the pre-service teachers' confidence and competence in GBL indicated significant development for all students. The gender gap in competence level disappeared and the effect size of the gender gap in confidence level reduced considerably.

Keywords: Pre-Service Teachers, Game-Based Learning.

Symposium 5.2
Curricula in Schools

Symposium: Moving on with informatics/computer science curricula – challenges and opportunities

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Introduction. Over recent years there have been significant changes regarding computer science/Informatics curricula in many countries. While some countries have retained and continually updated their computer science/informatics curricula as strong scientifically focused offerings, other countries moved towards a more user-oriented approach emphasizing basic digital literacy and digital skills. However, with the recognition that we are in a digital age where how we live our lives in leisure activities, engage in education and work are increasingly governed by technologies, policymakers have recognized the need to develop understanding of the digital world to enable creation rather than just use of new technologies. Computer science/Informatics as the scientific discipline that underpins the digital world, and is essential to all disciplines and professions, has become increasingly important as a school subject in many countries. There is a need to equip students with the knowledge and skills to bring about change, to contribute to the development of their digital environment

and to ensure the evolution of a safe, secure, environmentally conscious and just society. In some countries these policy changes have resulted in major curriculum developments some of which have now been in place for several years and we are seeing some of their implications. At the same time, computer science/informatics is a relatively new discipline and while many of its fundamental principles remain relatively stable there are also new and rapid developments that make specifying and maintaining curricula challenging. Furthermore, while there has been much research into how students learn concepts and techniques of computer science/informatics, progression pathways are less well understood in this subject than in other curriculum subjects. In this symposium we will examine some recent developments in curricula relating to computer science/informatics in compulsory education. Furthermore, we will consider the implications for future development of curricula and what can be learned from experiences in various countries. We will also consider how recent technological changes need to be considered in relation to curriculum specifications. Thus we will provide some new perspectives on current challenges. More specifically we expect to address the following questions:

What is driving the emphasis of specifications for informatics/computer science curricula in different countries? What do we know about how students learn some of the core concepts and processes of informatics/computer science that will enable us to design structure and progressions in curricula? How should we incorporate new challenges associated with rapid developments in artificial intelligence and machine learning into informatics/computer science curricula? What is the relationship between an informatics/computer science curriculum and other academic disciplines?

The symposium will comprise a series of short papers arranged in clusters with opportunities for questions and discussion at the end of each cluster of papers. In addition to the oral questions and discussion during the symposium we will also make use of a discussion board and Twitter feed to enable more extensive discussion to try to shed light on these important questions.

The first cluster of three papers focus on recent redevelopment and specification of informatics/computer science curricula in three different countries: Australia, India and Austria with different approaches to curriculum design. The next two papers discuss the issues and approaches for implementing curricula including challenges for identifying progression in conceptual understanding. The remaining four papers look ahead to how developments in machine learning and artificial intelligence need to be accommodated and how computational approaches can be developed across the sciences.

Keywords: informatics, computer science, programming, curriculum, computational thinking, artificial intelligence, curriculum integration.

Changing computer curricula in Australia

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Abstract. Curriculum responsibility in schools was vested with the states of Australia by the constitution of 1901. A nationally developed curriculum for school subjects was made available from 2014 and was incrementally adopted or appropriated by the states in various ways. At that time, computers were in the curriculum as a general capability to enhance learning in all subjects. This was the Information and Communication Technologies (ICT) general capability. The core ICT capability is conceived as comprising Investigation, Communication and Creation. These elements are underpinned by 'managing and operating ICT' and 'applying social and ethical protocols and practices'. Because different learning areas of the curriculum were developed along a staggered timeline, Technologies did not become available until 2016. This contains the Digital Technologies subject. At its core is the concept of creating digital solutions which is approached by processes and production skills. Underpinning these are Digital Systems and Representation of data. Therefore, the Digital Technologies subject is quite separate from the ICT general capability. Very few teachers encountered it in their own schooling or have encountered it in their pre-service training. While 'creating digital solutions' is core to the subject, coding or programming are mentioned very sparsely in the document. In 2020, the Federal Government agency responsible for the school curriculum announced the commencement of a Review. This review is expected to produce public consultation drafts of a new version of the curriculum in late April 2021. The Review has a key task of simplifying the curriculum. Partly due to the staggered implementation, teachers focused on core subjects, and felt overloaded as other subjects were released. Consultation panels have hinted that ICT may be re-labelled as 'Digital Literacy'. Recent indications are that principals and teachers confound the current ICT capability and the Digital Technologies subject. 30% of tools and websites used in Digital Technologies were seen to be content management systems, office suites and other generic tools rather than subject content specific software applications.

This session will show how the changes in the public consultation draft help to solve this problem or compound it. We will reveal the answers to the following questions about the proposed update for Digital Technologies:

1. Will Australia abandon the general ICT capability (as per the UK) to provide greater focus on Digital Technologies?
2. Will Australia put a greater emphasis on coding/programming than the current meagre mention?
3. What do pre-service teachers think about the proposed changes?

Computational Thinking in Indian K-12 schools: Opportunities and Challenges

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Abstract. In the Indian K-12 education system computer sciences or computer applications have always been offered as optional subjects in the higher secondary (grades 9 & 10) curriculum across different school boards. These courses cover a range of topics like basics of Information Technology, HTML, Networking, and Scratch. While there is no set computer science curriculum for upper primary grades in Central and State boards, one of the International school boards covers topics like spreadsheet and program coding. Besides formal school setting, coding and adopting certain principles of computational thinking (CT) has been implemented in informal learning spaces like out of school camps and online coding classes by Ed-tech startups especially in COVID pandemic period. The education policy on ICT in schools of 2012 emphasized largely on ICT literacy and competency in schools across grades. For the very first time in Indian Education policy, coding is brought into focus and as early as 6th grade. The National Education Policy 2020 of India highlights the need of learning computational thinking and coding by students. The Ministry of Education, India plans to implement compulsory coding and other CT related topics in the curriculum by 2022 - 23. Making CT and coding compulsory from grade six is a forward-looking move for many reasons. Firstly, it allows critical and creative problem solving (Wing, 2006; Shute et al., 2017) at young age, if designed well, CT components can be integrated with core subjects and connected to learners' context, confidence in competence to adapt technology through CT fosters a sense of digital agency (Passey, et al., 2018) and prepares young minds for 21st century careers and knowledge society (Dede, 2010). However, the implementation of CT and coding seems far more complex than the task of integrating technology within the curriculum in the start of this decade. Some of the challenges or aspects to consider for policy implementation would be:

- Adaptation in existing curriculum
- Teacher preparedness
- Tutoring and assessment
- Pedagogy as per Socio-economic status

Curricula for Digital Education as a Moving Target

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Abstract. In Austria, since the late 1980s, the elective subject Informatics has been implemented in many lower secondary schools for interested pupils, dependent on engaged teachers. It was the time of pioneers among teachers and pupils when the "magic of the beginning" took effect and the upcoming curricular autonomy made possible an increased offer of Informatics/ICT classes. Within the process of profile building, Informatics and ICT have proliferated, and some schools still profit from this spirit of optimism until today. Moreover, since 1990 an integrated use of ICT has been enacted by the Ministry of Education especially for German, English, Mathematics and Geometric Drawing as "IT-enhanced subjects". This approach of implementing ICT at lower secondary level for about ten years was well-intended but not really effective. Interestingly, at that time the debate about Informatics as a subject in its own right and the integration of ICT in other subjects caused not more confusion than today. However, at the turn of the millenium the Austrian Ministry of Education failed to anchor (basic) Informatics education at lower secondary level within a new curriculum. Within the so called "Curriculum 2000" which was valid until 2018, the only curricular reference for the overall use of ICT was expressed in a few sentences: "Innovative information and communication technologies and mass media penetrate more and more all areas of life. Particularly multimedia and telecommunication are determining factors for the evolving information society. As part of teaching, these developments have to be taken into account, […] and the educational potential of ICT has to be harnessed." After years of discussions and discourses, finally in 2018 a broad and comprehensive curriculum for a new subject "Basic Digital Education" for lower secondary education has been developed and enacted, forcing all schools to offer a certain amount of dedicated ICT and Computing hours, either integrated across other subjects or within a subject in its own right depending on the preference of the school. Now, within the project "Curriculum 2020" a bigger reform affecting all subjects with digital references, accompanied by a completely new curriculum for "Basic Digital Education", is in the review phase and is expected to be enacted in two years. This paper will describe and discuss these latest developments, as part of and with regard to the broader perspective of Austrian initiatives to digitize schools.

Refining granularity of the programming concepts specification in school informatics

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Abstract. In our work, we design and develop interventions for school programming for all learners at primary and secondary, as we consider programming a suitable way for studying learning processes and cognitive complexity in the field. In this context we have pointed out too coarse-grained vocabulary in different curricula when specifying learning goals in the domain of programming. A curriculum for example states that pupils should be taught to use sequences, selection, and repetition in programs. But what exactly may such a broadly defined target mean? When can we consider it met? How can an intervention in the next stage follow up on such indistinct achievement? When we in our design research projects iteratively develop interventions, we tackle this issue as follows: for each concept we strive to identify different operations which pupils will perform with them, properly order them by their increasing cognitive complexity and project these operations into the tasks pupils solve. We then specify learning objectives and assessment criteria not in the scale of concepts but in the scale of operations performed with the concepts. For example, in the context of the concept of iteration, pupils: (i) directly control a sprite and notice a record which is being built simultaneoiusly, (ii) read such record and perceive its properties like the length or the presence of a certain command, (iii) execute a record by giving it step by step to the sprite, (iv) build such a record in advance – i.e., program future behaviour for the sprite, etc. In [1] we identified and assessed a gradation of seven levels of operations with iteration. In this paper we present our approach to programming concepts and the operations corresponding to them, together with an overall gradation of tasks that we iteratively design, develop and evaluate in our design schools for each year of upper primary and lower secondary school. Within this overall gradation we can identify threads of tasks, which systematically implement developmentally appropriate and carefully graded steps supporting pupils to create their deep understanding of the concepts. Creating evidence-based interventions is just one of the two goals of our design research activities. The other one is to expand our understanding of the cognitive complexity of identified operations. In the paper, therefore, we also present our methods and findings when working with a sample of teachers in two countries during a pandemic (when our PD sessions and collaboration were run online). Namely, we research whether and how teachers themselves perceive cognitive complexity of the operations associated with each programming concept.

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Implementing CS curriculum in K-12

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Abstract. I am working on a book "Computational thinking – in educational practice", which is supposed to bring and explain CT to teachers and educators. The book is not going to be a pedagogical or didactical guide which will show teachers how to design and organize lessons on CT topics, such a guide is planned next. In fact, I am convincing a reader that there shouldn't be any lesson with CT as a theme. The book starts with a warm-up, a collection of Sudoku which show that very young students are easily able to use CT mental tools: abstraction, decomposition, algorithmic thinking, debugging and generalization with no priori a formal introduction. Then we comment, with the reference to CT, unified aims and attainment targets of the core CS curriculum for K12 (announced in 2015 and introduced in 2017-2019 to our education system [1, 2]), and discuss fundamental issues behind the successful implementation of the curriculum: thinking before programming, spiral approach, CT, the role of programming, CS applications and CS in other school subjects, problem and project-based learning. In this talk, we will focus on integrating unplugged CS approach and Bebras tasks with students' activities on particular topics of lessons. The unplugged approach, originally introduced as an outreach to CS novices, we prefer to call "computer stand by approach" and apply at any level of instruction as a step at which students learn a concept or algorithm before they sit at a computer. In fact, I have already used this approach in 1970-1980's when with students we learnt and executed algorithms before writing their computer implementations. Regarding Bebras tasks, they are used as a kind of a thematic warm-ups. The tasks are first transformed to open versions (interactive or with open window) and then we ask students to generate their solutions. We expect that students produce a solution as an effect of applying a problem-solving strategy which in fact corresponds to the operational definition of CT.

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Curricula considerations resulting from recent developments in machine learning and artificial intelligence

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Abstract. Developments in machine learning (ML) and artificial intelligence (AI) have been accelerating in recent years to the extent that they are pervading every part of our lives. These developments have important consequences for school curricula because everyone needs to understand the opportunities provided by AI and the potential issues and threats of these technological developments. At a meeting of experts in Quebec, Canada in October 2019 hosted by EDUsummIT, a global community of researchers, policymakers and practitioners committed to supporting the effective integration of Information Technology (IT), recent developments in machine learning were examined and their implications for education were analysed [1]. A particularly challenging issue pinpointed was the importance of explainability and accountability of machine learning systems for different educational purposes. This work identified what teachers and students need to understand in order to make appropriate use of machine learning for their own learning and to understand the broader uses in society and the associated challenges. Furthermore, outcomes from the recent IFIP TC3 webinar, "Social Impacts of Big Data Analysis and Machine Learning – Educational Implications" identified a broad range of challenges associated with such developments. These challenges include: the meanings of key terms have been drifting so that they can be misleading or confusing; AI is complex and pervasive but often hidden; ambient AI together with 3D visualisations, intelligent agents, biometric recognition of learners and cognitive AI could enable greatly increased sophistication and personalisation of learning but how such complex technology supports and empowers both teachers and learners still needs much research. In this paper we draw on these recent discussions to focus on the curriculum implications of developments in ML and AI focusing specifically on the needs and challenges for the informatics/computer science curriculum but also considering how knowledge and skill development in AI and ML can empower learners and develop their agency as citizens.

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Beyond Computer Science – Science+Computing: the integration of computational tools and processes into academic disciplines

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Abstract. While the U.S. has engaged in significant efforts to grow computer science (CS) education in K-12, state-based decision-making has made approaches to computer science vary widely from stand-alone CS courses to the integration of computational thinking into disciplinary learning. Ongoing attention on equity points CS program developers towards compulsory education as a means to reach all students and a home for the development of foundational competencies. This session shares progress of Science+C (Computing), a National Science Foundation project funded to create and institutionalize Computational Biology, Computational Chemistry and Computational Physics courses for schools to adopt as replacements for traditional science offerings. Science+C courses connect students' experiences in school with the skills and knowledge used in the contemporary scientific enterprise; help students explore scientific phenomena as they develop skills to use, decode, and modify computer models and analyze data; and better understand both scientific processes and how computational methods and tools have changed the nature of scientific inquiry. This session highlights curriculum examples and shares lessons learned from the ten modules per courses piloted. A quasi-experimental research study is evaluating the impact of the intervention on student computational thinking and science outcomes, and changes in teacher skills and capacities. Results will inform how we prepare students to use computational approaches to solve real-world problems in science and other fields, and through scientific exploration made possible by computational approaches, how Science+C improves or enhances student understanding of science.

Keywords: Computational Science, Computational Thinking, CT-integrated STEM, Modeling and Simulation, Computer Science, Workforce of the Future

Integrating the New Zealand Digital Technologies curriculum across the curriculum – The current, future and potential

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Abstract. The effective integration of digital technology to support learning is not a new concern. Its integration, especially across the curriculum, has been a focus since computers became more readily used and adopted in schools [1]. In recent years, however, there has been a push to reconceptualize and reinforce the role of digital technology within the classroom, whereby emphasis is placed on supporting students to be creators and producers rather than passive consumers of technology. Around the world many countries are evaluating their curriculum to explore how digital technologies can be better integrated into the schooling curriculum [2]. New Zealand has recently undergone a change to better situate the use and adoption of digital technology. These changes have emphasised the role digital technologies, and related CS concepts of Computational Thinking (CT), as core concepts to be integrated in the curriculum from the first year of schooling. The change has also emphasized the design and development of digital artifacts cannot remain siloed in one subject but rather integrated across the curriculum. Supporting teachers to develop their own competencies, where technology usage in schools moves beyond consumption, will be important for the effective reconceptualizing and placement of digital technologies inside schools [3]. In NZ the siloing of subjects has made the integration of these new aims especially difficult. However, by providing teachers with an opportunity to explore way to integrate digital technologies across different subject domains, may mean teachers are better supported in driving learning, where technology is situated as a fundamental component of the learning. This presentation explores the current, future and potential for effective crosscurricular integration and how emerging technology can potentially be the catalyst to support cross-curricular learning. The presentation explores the outcomes of a oneyear project undertaken with two high schools in NZ, exploring how the new curriculum outcomes can be achieved. The study explores how new technologies, such as mixed reality (MR), can provide unique and creative opportunities to draw learning across different subject domains. The presentation will draw out the opportunities and barriers these changes have had on teaching and learning and the future potential this brings to better engage learners.

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What to Teach in Computer Science and How to Teach It

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Abstract. Adding computer science as a separate school subject to the core K-12 curriculum is a complex issue that involves many legislative, administrative, political, and educational challenges. The latter will be the focal point of this talk. In particular, there are two major educational challenges related to: (a) what computer science content to teach across different educational levels, and (b) what body of knowledge do teachers need to have to be able to teach the computer science curriculum. Over the years, a variety of computer science curricula, representing different views about what is important to teach in computer science and when, have been proposed in the literature and or enacted in different countries, such as UK, USA, Austria, Germany, Israel, Greece, Cyprus, and recently Australia. While, during the last two decades, a lot of work has been done by the computer science education community in promoting computer science as a school subject in secondary education, not a lot of work has been done regarding the integration of computer science in the elementary school curriculum (grades K-6, approximately from 6 to 12 years old). Despite the fact that a number of computer science education researchers have written about their concerns in regards to teaching computer science in K-6 because of learners' very young age, recently, there has been much impetus in bringing computer science experiences to elementary school children. Clearly, early computing education is now at the forefront, and, studies toward this line of research are urgently needed in order to develop an informed body of knowledge about learning and teaching computer science starting from elementary education. Accordingly, in this talk, we will explore the prospects of a curriculum framework with a focus on promoting computational thinking skills for the age of 6 and above, before covering more theoretical and applied concepts of computer science in secondary education. Specifically, in this talk we will address the following two questions: (a) what computational thinking skills should a computer science curriculum promote? and (b) what knowledge do teachers need to have to be able to teach computer science? The first issue will be discussed from the perspective of designing an authentic computational thinking curriculum with a focus on real-world problems. The second issue will be addressed within the framework of Technological Pedagogical Content Knowledge (TPCK), and, it will be argued that TPCK is an important body of knowledge for the field of computer science, because technology is at the center of the computer science domain, either, as a means in itself, or as a means for achieving or teaching something else.

Computational Thinking in the Curriculum - What is next in Finland and Sweden?

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Abstract. Through an increased focus on computing and computational concepts in the school curriculum the Nordic countries are preparing to equip themselves to explore the opportunities that Industry 4.0 and beyond can offer. Realising this vision has inevitable consequences for the curriculum in compulsory schooling (preschool to year 9) as new competencies need to be scaffolded, and adapting to technological change involves also integrating topics and skills from the areas of computational thinking, programming and digital literacy into existing curricula.Finland and Sweden have chosen not to create a new school subject, advocating integration of these skills and competencies into existing subjects such as Arts and Crafts, Language, Mathematics and Technology. In addition to pupils in compulsory school a large section of the population who have already completed compulsory schooling must be provided with the opportunity to equip themselves with the necessary digital skills to remain empowered citizens in a strong democracy. Viable options for achieving this objective are envisioned to be through an "open door" policy for universities, in which avenues such as widely available MOOC courses might provide a path to empowering citizens to be more than digital consumers.This contribution reports on the current situation in Finland and Sweden, providing an analysis of what approaches are being taken to scaffolding access to computational thinking for the broader population, as well as compulsory school pupils.

Keywords: computational thinking, digital skills for all, matriculation exams, open doors policy, alternate pathways to higher education

Symposium 6.1
The Migration to Remote Teaching and Learning at the University of KwaZulu-Natal (UKZN) during COVID-19

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The Migration to Remote Teaching and Learning at the University of KwaZulu-Natal (UKZN) during COVID-19

Abstract. This symposium comprising 3 papers, offering three different lenses into the above topic: the first is from the dual perspective of a lecturer at the institution implementing remote teaching and learning changes to modules and a researcher in higher education specializing in the access and success of students in higher education in the global south given their unique contexts, the second is from the perspective of an education technologist on remote pedagogies for success in higher education and the third is from a teaching and learning managerial perspective addressing staff requirements for digital learning and successful implementation of teaching and learning methodologies. The symposium will address the impacts of the corona virus pandemic on higher education in the global south at one public university where rural poor first generation students are in the majority and there are several accompanying challenges already in existence prior to COVID-19, due to the country's apartheid legacy which disadvantaged masses of black students denying them access to higher education. The papers thus respond specifically to how a sudden migration to remote forms of teaching and learning were adopted by the institution during the first lockdown to ensure a continuation of the curriculum in 2020 despite a sudden curtailment in government funding due to the pandemic, the preparation of staff for online forms of teaching and learning, the digital tools chosen for this migration and their suitability for the students and the readiness and support mechanisms in place for the students to ensure their success for 2020.

Student access and accessing students for success during the pandemic

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Abstract. Public higher education institutions in post- apartheid South Africa foregrounded Black (especially African) students' access (MacGregor, 2014) and their success in endeavours to right the wrongs of an unfair racially skewed higher education system (Manik & Ramrathan, 2018). This paper is composed from the perspective of a university staff member who is also a seasoned higher education researcher using primary and secondary data sources harnessing my own experiences and studies undertaken with Black, predominantly African students. Thus, the data is elicited from studies undertaken on institutional access and success of students pre covid, my engagement with my students as well as institutional reports by the office of teaching and learning at UKZN during the pandemic. The analytical framework guiding this paper is that of Bourdieu (1984, 1986) and the later work of Bourdieu and Wacquant (1992). The commitment by the University of KwaZulu-Natal to respond to achieving quality education and the needs of Black African students was evident in the research agenda promoted by the teaching and learning office and the constellation of student support measures instituted across the campuses. Despite this, student drop out, progression and retention remained high on the university transformation agenda, similar to other public higher education institutions, due to a multiplicity of complexly linking factors (Lewin & Mawoyo, 2014, Manik, 2015) such as school quintile ranking, poverty, epistemological access, language of instruction, first generation students and rurality amongst others. The challenges of transforming of higher education at UKZN (and in democratic South Africa) was further disturbed by the unanticipated arrival of the world wide COVID-19 pandemic with lockdown measures which prevented students from physically accessing campuses forcing the university to turn to remote options of synchronous and asynchronous teaching and learning. However, I argue that a seamless transition was not possible given that many Black-African students hail from poor rural households, located in areas without adequate infrastructure to support their education and who are first generation students. This paper thus outlines the university's teaching and learning challenges in respect of its Black- predominantly African students prior to the pandemic as evident in the literature and the escalated complications during the lockdowns followed by the collective efforts of its staff and leadership to support students in achieving success during this crisis period.

Keywords: Black students, student access, success, support, challenges for teaching and learning.

Exploring the Migration to a Digitalised Curriculum at UKZN

Simon Bheki Khoza

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Abstract. The COVID-19 revolution demanded that higher education institutions (HEIs) in South Africa, as with most other countries globally, migrate to a digitalised curriculum (DC) through Fourth Industrial Revolution (4IR) resources (Khoza, 2020). The DC is a plan for or of digital technology-driven education. The COVID-19 revolution[1] compelled the University of KwaZulu-Natal (UKZN) to migrate to DC in order to complete the 2020 academic year or calendar. Pragmatism, critical discourse analysis (CDA), and community of inquiry (CoI) (Anderson, Rourke, Archer, & Garrison, 2001; Ngubane-Mokiwa, & Khoza, 2021), frame the document analysis used to generate data for this study. Purposive, with convenience sampling, is used to select the published documents that carry information on the migration to DC at UKZN. It is for this reason that this study explores and understands the migration to a DC at UKZN through the use of digital tools. Findings suggest that, while UKZN had the professional presence of migration through engaging Moodle, it started the migration through the use of Skype and Zoom 4IR video meeting resources promoting social presence. The migration seemed to miss the cognitive presence as an important ingredient of a DC which addresses individual personal needs. Consequently, this study recommends a DC that balances professional, social, and cognitive presences, in order to address teaching, community, and individual personal needs, respectively.

Keywords: Cognitive presence; COVID-19; digitalised curriculum; professional presence; social presence

[1] The word revolution describes the rapid and disruptive changes in teaching and learning caused by technologies changing their form; this in 2019 under the influence of the coronavirus of 2019 (COVID-19).

Reflections on the impact of COVID-19 on the mode of delivery from face to face to remote online teaching and learning in a South African University

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Abstract. The realities brought about by the onset of the COVID-19 global pandemic has affected regular operations in the higher education sector. The consequential lockdown in the flattening of the COVID 19 curve has caused Universities to close their doors and revise the dominant mode of delivery from face-to-face to remote online teaching and learning. This shift means that higher education institutions have had no option but to use electronic platforms to communicate with students and deliver programs. I draw specifically on staff readiness, what challenges, opportunities, and gains experienced during the Covid-19 pandemic, and the rushed shift from face-to-face to emergency online teaching and learning to ensure students were not left behind. Data was generated during reflections on my experiences as an academic leader in a South African university. Data were analyzed using thematic analysis. The chapter focuses on two research questions: What challenges and opportunities are experienced by students with online learning during the COVID 19 pandemic era? What activities were planned to enable and support academic staff to transition to online learning during the COVID 19 pandemic era? This paper uses Fraser's equity and social justice theory to reflect on the abrupt shift of the mode of delivery from face to face to remote online teaching and learning during the COVID 19 era. Findings illuminate the different nuances of exclusion that both abled and differently-abled students encounter in terms of their locale, accessibility to learning devices, learning environment, and ability to balance academic and home-life spaces. Findings also highlight gains, challenges, and effectiveness of the transition to remote teaching and learning during COVID 19 era. Concluding remarks and recommendations provide insights into how the opportunities and gains, albeit directly or indirectly, were experienced in this era and post this era, how the disruptions of the social life of the student and staff occurred, and the responses to that and how these can be overcome and addressed in this era and post COVID 19 era.

Keywords: Challenges, Online Learning, Opportunities, Reflections and Transition.

Demonstrations 7.1

Discussions on the Buttons Event Loops in micro:bit MicroPython Education – “was_pressed” and “is_pressed”

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Abstract. BBC micro:bit is popular all over the world. In Japan, K-12 full-scale programming education with micro:bit has begun in elementary school from April 2020. However, we have found that MicroPython in micro:bit have a slight difficulty with the "buttons event loops" method. In our demonstration, we will discuss about programming education with using micro:bit by taking a Rock-Paper-Scissors programming for instance.

Keywords: BBC micro:bit, MicroPython, Event Loop.

A Modern Curriculum Plan for Artificial Intelligence Based on Deep Learning

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Abstract. I have made a modern curriculum plan for AI to aim digital transformation. New AI is based on deep learning. Most of students or engineers must effectively learn it, so I will show you the way.

Keywords: Deep Learning, Machine Learning, Neural Network, Statistics, Linear Algebra.

Symposium 8.1
Vocational Education

Analysis of Practical Examples of Real-time Online Class on Agriculture in Space Using Collaborative Learning Tool "Digital Diamond Mandala Matrix"

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Abstract. The results of the analysis applied to the data obtained from a real-time online class using our collaborative learning tool “digital Diamond Mandala Matrix (dDMM)” application and the effectiveness of the application for real-time online class are shown. The class consists of a pre-learning assignment, a real-time online class using zoom, and a post-learning assignment. Students input data as pre-learning dDMMs before participating in the online class, and then join to the class of a lecture and discussions sharing the pre-learning dDMMs. And they also input data as post-learning dDMMs after the online class. Our dDMM application which is under construction, is something like a mind map limiting words or terms plus a text cell for explanation. We can easily view several dDMMs at a glance for comparing them each other, so it is highly suitable for an online class where only one screen can be shared. We applied text analysis to pre-learning dDMMs and post-learning dDMM using KH Coder and compared them each other. From the results, we found the differences among them, and the changes were probably occurred because students made use of the topics of the online lecture and discussions. Therefore, the dDMM application is an effective tool in real-time online courses. We will proceed the analysis furthermore for improving the course contents. We also have been improving the dDMM application for the students, who are not good at verbalizing images in their mind, can input images with supporting words or terms.

Keywords: Online Class, Collaborative Learning, Text Analysis, KH Coder

Vocational education during school shutdown - a Danish case on emergency remote teaching

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Abstract. This paper focuses on the emergency remote teaching during the temporary shutdown of physical learning environments in the spring of 2020. It presents findings from a survey among 14000 Danish teachers and students at vocational colleges and upper secondary schools regarding their experiences with online education. The analysis and interpretations of the survey data provide evidence suggesting that the teachers generally need professional development regarding online education and blended learning events. Most often, they did not succeed in their attempts to realize the potentials of online education: First, they did not manage to coordinate their expectations regarding the students' daily workload and individual need for teacher support. Second, they did not provide clear announcements and formative feedback. Third, they had difficulty supporting students experiencing learning difficulties and they did not support students with motivational challenges due to social isolation. To overcome these challenges, teachers need to be more informed by data and research than they were during the emergency remote teaching. This includes information derived from analysis of local data on students' independent and collaborative work, learning challenges, and perceived self-efficacy. Moreover, it includes information about the main findings in research about the benefits of blended learning compared with online teaching and f2f teaching.

Keywords: Blended Learning, Online Education, Vocational Education, Emergency remote Teaching

AsTRA – An Assessment Tool for Recognition and Adaptation of Prior Professional Experience and Vocational Training

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Abstract. Educational systems in most countries are differentiated and entail transitions between different school types. The different school types do not always support a transition without gaps or repetitions. For students, this can be very frustrating, demotivating and time-consuming. For example, many graduated IT specialists bring work experience, several relevant competencies, and previous knowledge from their vocational education and training into a degree programme in computer science – yet they still have to take the associated courses and pass examinations. To improve this situation and value the competencies brought along, we implemented a project to develop a comprehensive system to reward the prior knowledge of these students in various ways. One of our goals is to promote permeability between vocational and higher education, not only in computer science. The core element of that System is AsTRA, a comprehensive assessment tool that we developed to evaluate the usual learning content and its difficulty level. This system is designed to credit previous knowledge and adapt the students' learning paths, based on reliable decisions. In this paper, we present our tool AsTRA that supports these decisions as well as a brief overview of our resulting recognition system. The first implementation of the system took place in the winter semester of 2020/21.

Keywords: Higher education, vocational education, adaptation, permeability, assessment, assessment tool, educational systems, IT specialist, competence, recognition, recognition of prior learning, study program, bachelor computer science.

Symposium 8.2
Blended learning initiatives
at The State University of Zanzibar

The Viability of the Guidelines for Online and Blended Delivery Modes of Courses for University Institutions in Tanzania

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Abstract. The impact of the coronavirus pandemic has traumatized the entire world. The restrictions on social gathering, social distancing and lockdown measures necessitated both lecturers and students to master e-learning. With the coronavirus (COVID-19) outbreak in Zanzibar, the government decided to halt any type of face-to-face teaching, disrupting classes and resulting in students in all levels of education being unable to return to their universities and schools. Hence, COVID-19 pushed physical interactions to become virtual meetings and the need to redesign curriculum emerged. Educators and experts around the world turn to blended learning as one of the models proposed because it appears to be a viable and best-fit solution for educational institutes for at least a period of a few months. Tanzania institutions of higher learning were no exception. This situation has prompted the Tanzania Commission of Universities (TCU) to share a draft guideline for Online and Blended Delivery Modes of Courses for University Institutions in Tanzania to support universities that have switched from face-to-face learning to blended and online learning mode. However, this quick move in this unexpected critical situation of widespread COVID-19 cases harbours several challenges such as the limited infrastructure, readiness of students and academics, limited connectivity, technical knowledge and learners assessments, students and academia wellbeing, infrastructure, quality assurance – evaluation and feedback, funding and resource allocation. On a positive note, the use of open educational resources (OER) as an effective educational solution to overcome these challenges was considered. Although there is a draft guideline, the paper is questioning the viability of the proposed draft guideline, and called for adequate consideration to issues around the successful implementation of blended learning in universities.

Keywords: Zanzibar, SUZA, TCU , ODL guidelines, Blended Learning, Learning Management System, Higher Educational Institution.

A Study of Sustaining Blended Learning Initiatives to Enhance Academic Engagement at SUZA: Prospects and Challenges

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Abstract. The practice of blended learning at the State University of Zanzibar (SUZA) officially commenced in 2007 when Tanzanian-made Students' Information System "ZALONGWA" was introduced. Through this system lecturers were trained and were able to upload notes for undergraduate students. The system had limited features, and was found to be less user friendly. Five years later in 2012, SUZA introduced its own Learning Management System (LMS) through MOODLE in which some courses were designed and uploaded on the system for learning. During this time, some learning activities such as lectures, seminar presentations, tutorials and practicals were conducted via face to face while few activities were conducted online. Under these conditions, there was an apparent, compelling demand and the dire need to shift from face-to-face teaching to student-centred approaches that involve a more flexible approach of a blend of face-to-face and e-learning activities. Therefore, by early 2018, SUZA participated in a collaborative blended learning partnership project with East African universities. The project known as Partnership Enhanced Blended Learning (PEBL) led by the Association of Commonwealth Universities (ACU) with the support of DFID's SPHEIR and SEDA UK .PEBL, a four years project commenced in 2017-2021 was designed to address the critical academic staff shortages in East African universities .It underscored the use of blended learning in universities courses, learn to use, adopt, adapt resources on Open Education Resources (OER), and share scarce teaching resources through quality assured, credit-bearing degree courses, delivered through blended learning. This paper is based on a single case study research towards "the partnership of blended learning networks" at SUZA. It will highlight the prospects and challenges towards the enhancement of blended learning at SUZA. Through this partnership, SUZA has managed to design and produce three courses which are accessible on OER Africa. Platform, and the fourth one will be uploaded by the end of 2021. Similarly, SUZA has managed to train 100 plus lecturers to design and produce blended credible courses of high quality which can be offered on international

platforms. Designing and producing quality assured blended courses is said to be a daunting task and time consuming for both lecturers and university quality assurers who are in charge of reviewing the course. Through this paper, PEBL team would like to share lessons learnt and experiences on how blended learning courses were designed, developed and implemented including lessons learnt, achievements, challenges and hindrances faced in its implementation.The PEBL team, through this case-based sharing experience that will inspire colleagues from other African universities and others with similar context will gain some constructive feedback and inputs how to implement quality blended learning programmes in higher education. In essence, attitudes of both lecturers and students towards blended learning were positive.

Keywords: Blended Learning Initiative, Learning Management System, Higher Educational Institution, SUZA, Zanzibar.

The Quest to Enhance Internal Quality Assurance in Zanzibar Higher Learning Institution Using Digital Tools

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Abstract. Students' Evaluation plays a vital role in the teaching and learning process, especially in higher learning institutions. It helps to identify and clarify the obstacles that arise in the learning process and how to handle and solve those obstacles. Students need to be involved in the evaluation process since they play an important role as key stakeholders in the learning process. This paper aims to highlight how students are involved in evaluating teaching and learning processes at the State University of Zanzibar and how this process can promote quality assurance practices. Furthermore, this paper examines the use of Google forms and Padlet as digital tools to facilitate students' evaluation. This includes student's evaluation on courses content and relevances of the material, instructors' competencies and learning environment. The qualitative method was used to collect data through digitals tools from students, analyzed using thematic analysis and transcribed and coded to sort major and minor categories of different themes of study. The results showed that students were impressed with the technology integration in the teaching and learning process. Shortage of devices and poor internet access claimed the thing that did not go well during the weeks. Students recommended for university management and ICT personnel to ensure the availability of sufficient devices for students to learn and accessibility of fast and reliable internet services. This information is crucial for the enhancement of Quality Assurance as it informs the university management to improve infrastructure and services for quality education in the higher learning institutions.

Keywords: Evaluation, Quality Assurance, Digital tools, Qualitative method, HLI

Students' Perception on T – Learning During Lockdown Period due to Covid–19 in Zanzibar

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Abstract. Since the introduction of televisions in schools in the 1950s, the t-learning approach has been used. This technique has become a permanent potential in students' learning as a result of advancements in information and communication technologies. In this paper, we investigated the design, implementation, and students' perceptions of t–learning during the COVID-19 lockdown time. The t-learning platform was designed by the State University of Zanzibar's (SUZA), Center for Digital Learning in partnership with the Ministry of Education of Zanzibar, with pedagogical considerations, syllabus coverage, and remote interactivity in mind. Moreover, 15 TV sets with subjects' contents (Mathematics, Chemistry, Physics, Biology and English) were given to 15-selected government secondary schools in both Islands of Zanzibar to pilot the idea. The purpose of this paper was to assess the impact of t- learning in order to gain a better knowledge of existing students' attitudes toward t – learning. The paper is also discussing the difficulties that students appear to have had when they were forced to rely only on t – learning for their education while on lockdown.

Keywords: t-learning; Covid-19; lockdown; SUZA; Zanzibar

Session 9.1
Digitalization and Learning

Shifting to a Technology-Driven Work Mode: Workplace Learning and Dynamic Capability in the Case of a Public Sector Service Organization

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Abstract. Learning to operate in technology-driven working modes is topical in many organizations today due to the COVID-19 pandemic crisis. The pandemic has enforced especially knowledge working organizations to quickly shift to remote or hybrid working modes, where all or some of the staff are operating and collaborating via digital tools. The aim of this qualitative case study is to explore and explicate a learning story of an organization within the public sector, where the organization transitioned fast into a technology-driven hybrid working mode under the crisis. As findings, the paper presents the identified immediate and evolving facilitators that point to the organization's learning to develop capability for operating effectively in the enforced and volatile conditions. Additionally, the potential long-term organizational development effects stemming from the situation are visited. In the findings, social aspects of work, such as open communication, collaboration, and awareness gained emphasis, while digital technology is one of the ground enablers. We apply a frame of dynamic capabilities together with workplace learning and aim to provide new insight into their development processes with a cross-organizational approach. As practical implications, we suggest new understanding for management on how organizations may learn and fare under uncertainty, volatility, and transitioning to digital collaboration.

Keywords: Dynamic Capabilities, Workplace Learning, Remote Working, Hybrid, Facilitators, Qualitative, Case Study.

DigiFit4All - Conceptualization of a Platform to Generate Personalized Open Online Courses (POOCs)

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Abstract. The need for evaluated digital resources arose over the last years as blended learning applications became even more popular and distance learning essential. Besides well-known massive open online courses (MOOC) also approaches, which present individual learning resources to the users called personalized open online courses (POOC) are developed. Personalization is, in most cases, based on different information about the users. DigiFit4All is a project to develop a platform for POOCs, including open teaching and learning resources for lower and higher education. In the background, a competency model is used, which enables the definition of learning outcomes for courses, the determination of learning paths, and the assignment of learning resources. With the help of pre-tests, competencies that are already known can be identified. The learning resources are integrated into a learning management system (LMS) which imports them from open repositories. This contribution gives detailed information about the concepts of the DigiFit4All project and compares it to other approaches.

Keywords: POOC, e-learning, digital learning resources, competency models

Pandemic Education: Lessons Learned

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Abstract. The article summarizes experiences from more than one year of pandemic education. After presenting the calendar of events regarding preparation of the paper and reactions of Polish education authorities, motivation to write this paper was described. In the next point review of literature devoted to different aspects of pandemic education from the last year is presented. Later a few basic terms from the field of education were recalled describing author's experiences with Small Private Online Courses (SPOC) created for faculty staff and educational newsletter published on faculty level. Next simple ways of preparing multimedia objects of knowledge were discussed. Seven different types of multimedia recordings were recognized: whiteboard (simulation of whiteboard in class), slides (classical slides with audio track and video), mixer (use of different sources), mixer plus (use of slides and white board at the same time), paper (use of scanned paper notes), talking head and audio talk. In next part educational Seneca effect was described. To answer on the question why growth is slow, but collapse is rapid several factors causing the erosion of educational system are listed. Later it was proposed to use the paradigm of flipped education accomplished by formative assessment. This is especially important because classical exams and tests have limited value due to e-cheating. Use of formative assessment, a frequent, interactive assessment of a student's progress and understanding of material so that one can determine how the student is to continue to learn and how best to teach it partly solved the problem. This was performed within a frame of Synchronous Online Flipped Learning Approach (SOFLA). SOFLA was developed to align flipped learning principles with online instruction. In this approach flipped learning moves to asynchronous space. In-class work is competed in synchronous class session when students and teachers are present. The key advantage of this approach is that by meeting synchronously regularly teachers and students can clearly distinguish between two contexts of learning process: in-class synchronous and out-of-class asynchronous. Effectiveness of SOFLA during pandemic was investigated in the same way as in China. Results of both surveys were compared. In the last part attitude of the teachers towards hybrid and blended learning modes were investigated and compared. The article is supplemented by some comments regarding future of education based on comparative analysis of the situation of teachers in Poland and around the world.

Keywords: Pandemic Education, Flipped Classroom, Formative Assessment.

Symposium and short paper 9.2
Smart Agriculture Education

Strategies and Policy in Indian Agricultural Universities

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Abstract. India has an history of more than 100 years of organized teaching, research and development for agriculture and has grown from few teaching and research institutes at the beginning of 20th century to one of the most productive, vibrant and advanced agricultural systems in the world. Starting with just 17 Agricultural, 3 Veterinary and 1 Agril. Engineering colleges in 1950, now the country has 63 State Agricultural Universities (SAU), 4 Deemed Universities, 3 Central Agricultural Universities and 4 Central Universities with agricultural faculty with more than 400 constituent colleges and intake capacity has risen from less than 5000 to more than 50000. The Indian Council of Agricultural Research (ICAR) - SAU Model has been quite successful and adopted in many Asian and African countries. The Government has made substantial investment for development of research capacity within the ICAR and SAUs. ICAR has provided leadership, resources and environment for development of pluralistic system and also facilitated partnership with International organizations which paid rich dividends in terms of making country self sufficient in food production, diversifying production and reducing rural poverty. Several new initiatives have been introduced in education system in India viz., Implementation of V Deans Committee Recommendations with a focus on Experiential Learning and student READY (Rural Entrepreneurship Awareness and Development Yojana) programmes apart from including several new courses in emerging areas of Science and Technology. This has brought a major qualitative and quantitative impact in teaching and learning process. The present strategy is to align agricultural education system in tune with National Education Policy (NEP) – 2020 of Govt. of India. Several policy initiatives are taken in enhancing Industry-Academia linkage, Alumni network, Dual degree programmes, Specialized courses for Entrepreneurship, Skill and Personality Development apart from Post Doctoral fellowships, Emeritus Professors, Emeritus Scientists, National Fellows and National Professors. The visibility of Indian universities is enhanced through attracting International students mainly from African and ASEAN countries. To enhance faculty competence, both ICAR and State Governments are encouraging training programmes both at National and International level in cutting edge technologies. UAS, Dharwad is in the forefront in encouraging Startup culture through funding from RKVY-RAFTAAR of Govt. of India, ICAR-NAHEP of World Bank, Biotechnology Industry Research Assistance Council (BIRAC) of Department of Biotechnology, Govt. of India and Karnataka Innovation and Technology Society (KITS) from Govt. of Karnataka. With the implementation of new policies, there is likely enhancement in Gross Enrollment Ratio (GER) in higher education which eventually may lead in India becoming USD 5 trillion economy by 2025 apart from sustaining Gross Domestic Product (GDP) growth rate.

Developing Smart Agriculture at UAS, Dharwad

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Abstract. The development and usage of Smart Agriculture system based on Artificial Intelligence and Machine Learning is changing the field of agriculture sector by not only improving the crop production but also making it cost effective. The effects of drastic changes in climatic conditions have seen lowering crop yields and hence there is need to focus on adoption of smart technologies in the field of agriculture. The combination of Internet of things (IoT) and Machine Learning can certainly help in lowering the cost and also in increasing the scale of production through the collection of time series data from sensors. Recognizing the importance of Artificial Intelligence (AI), the National Institution for Transforming India (NITI) Aayog initiated National Program on AI, with a view to guide research and development in new and emerging technologies. Considering the growing acceptance of farmers for the internet and mobile based services, Indian Council of Agriculture Research (ICAR) made an attempt to provide valuable agro-met information to the users through web portal (Crop Weather Outlook) which provides 'Value Added Agro-advisory Reports'. UAS, Dharwad has taken initiatives in setting up of GIS lab and remote sensing facilities through which early warnings and forecasting of weather, pest and disease incidence, crop coverage, etc., are being monitored. Facilities are also created for an Automatic Smart Irrigation Decision Support System (SIDSS) to educate the farmers for effective water management. Watershed delineation, mapping soil resources, land capability and crop suitability, identification of water logged and saline prone areas, flood mapping, land use and land cover, nutrient mapping for precision agriculture are being done at UAS, Dharwad. Algorithms are being developed for disease forecasting, nutrient management, precision water management and sensor based irrigation scheduling in association with Indian Institute of Technology (IIT), Dharwad and Fourth Paradigm Institute, Bengaluru. Farmers are being trained to use National Agriculture Market (e-NAM), an online trading platform for agricultural commodities set up by Government of India. Intelligence without ambition is a bird without wings, agriculture without economy is nothing and so, the market linkage is a must for agriculture and to realize these, models on price forecasting for different commodities are developed by the University. Efforts are being made to develop drones for spraying of chemicals and also to monitor crop health status. Efforts are also being made in establishing Centre of Excellence in Smart Agriculture with a view to skill, reskill and upskill agriculture graduates, providing industry ready man power and information to educate farmers on smart agricultural technologies at UAS, Dharwad.

Entrepreneurship Education at UAS, Dharwad and the Guidelines for Achieving

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Abstract. Entrepreneurship development education has been given thrust by government and State Agriculture Universities (SAU) to address the problem of unemployment and overall economic development. One of the milestones in this direction is the fifth Dean's Committee Recommendations to introduce one exclusive course on entrepreneurship development for undergraduate students as student READY (Rural Entrepreneurship Awareness and Development Yojana). University of Agricultural Sciences, Dharwad is one of the Universities adopting the recommendations of ICAR. The course AEX 301 is of 1+1 credit, where students are taught about basic concepts of entrepreneurship, project identification, management and government support. Under student READY programme, students are placed at grass root level unit of Agriculture Department referred to as (Raita Samparka Kendra) for eight weeks to understand the agricultural ecosystem in rural areas and the practices and function of the farmer. Students undergo Agri-clinic for two weeks, where students collect soil samples, do field based diagnosis of pests and diseases and provide recommendations. In order to give institutional experience, students are placed in farm science center (Krishi Vignan Kendra), Agriculture Research Station, Processing plants and farms for five weeks. At the end, students are placed in an industry to get first hand experience of enterprise management and enable them to prepare a viable project. Students are guided and monitored closely by the faculty to motivate them towards entrepreneurship. UAS, Dharwad has experiential learning modules in six disciplines including NRM (Natural Resource Management), Bio Pesticides, Commercial Agriculture, Livestock Development, Landscaping and Floriculture, Food processing where students learn and earn. UASD is implementing world bank funded Institution Development Plan (IDP) under National Agriculture Higher Education Project (NAHEP) which has a prime objective of developing entrepreneurship and promoting startups. Under the project, sixteen EDP programmes covering 3609 students have been conducted during 2019-21 in addition to sixteen webinars on different opportunities in entrepreneurship development giving opportunity to 2593 students to learn the entrepreneurship ecosystem. Ideathon workshops were conducted to pitch in idea addressing a specific problem of farmer where 60 ideas were presented. Among them, 35 were shortlisted and 13 are in the process of prototype development. UAS, Dharwad has established three Innovation Cells and five Incubators in constituent colleges to provide facility for prototype development. Another project called RAFTAAR (Remunerative Approaches for Agriculture and Allied Sector Rejuvenation) promotes Agribusiness incubator. It has promoted over 20 startups in Agriculture and allied areas. A Section 8 Company, ASTRA (Association for Startup and Technology Refinement in Agriculture) has been established to support entrepreneurship and startups by students. Efforts are being made to establish close linkage with industries as well as alumni entrepreneurs to strengthen the endeavor of entrepreneurship development in agriculture.

Educational programme for climate change adaptation for food and water security: an agricultural, social science, business and information technology perspective

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Abstract. The United Nations Sustainable Development Goal one called for eradicating extreme poverty. This is a research proposal to develop an educational program with the goal of promoting food and water security through climate change adaptation. The program is for different stakeholders, such as, research institutions, government, private sector, farmers, and technology agents. The expected contribution includes the multi-disciplinary aspect of the project ensures different views in ana-lyzing climate change for economic and societal gain, embrace opportunities offered by innovations and technology advances in promoting agricultural activities for food and water security, evaluate and propose ways of addressing societal challenges related to climate change, food and water shortages and propose ways business (pri-vate sector) can contribute to the topic of climate change.

Keywords: Sustainable Development Goal one, climate change adaptation, food securi-ty, educational program, economic and societal gain.

Symposium 10.1
History

Celebrating 50 years of IFIP WG3.4 - Past and present of IFIP WG 3.4 - looking for future

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Abstract. IFIP TC3 Working group 3.4. was established on 1971 under the title "IT-professional and vocational education in information technology". The origin of this working group was to address also IT and education issues beyond primary, secondary and tertiary education and curricula. The use of computers and need of learning to use computers in professional/vocational jobs started to evolve along the development of administrative or electronic data processing (ADP/EDP). Education and training for these professionals and vocational experts was an important area and now still growing. The objective of this symposium is to make a retrospective of IFIP TC3 working group 3.4. activities and the documented work for professional and vocational education in IT, lately also in the area of higher education after the merger of IFIP WG3.2 to IFIP WG3.4. It will also include an invited opening presentation about experiences on working for IFIP.

Pertti Järvinen, professor emeritus from Tampere University – opening presentation "Experiences on working for IFIP; IFIP TC9 and TC3 collaboration opportunities"
Arthur Tatnall, professor emeritus and chief editor of EAIT, Victoria University, Australia – presentation "Historical outlook for IFIP WG3.4. activities and conferences"
Peter Juliff, professor emeritus from Deakin University, Australia -presentation "Comparison of International Academic Qualifications"
Nicholas Mavengere, Bournemouth University, Vice-Chair of IFIP WG3.4. on "IFIP W.G3.4 : The Sustainable Development Goals (SDGs) contributions and future activities"

Potential presentations (but not yet confirmed)
Ben-Zion Barta, retired inspector for Computer in Education, Ministry of Education, Israel
Mikko Ruohonen, professor and co-chair of the conference, Tampere University, Finland
Barrie Thompson, professor to 2011 at University of Sunderland, UK

The near-term result will be a joint paper of working group's evolution and history, links to the needs of current IT and education development and guidelines for future agenda. This will also serve as a testimony for many of those who do not know the background and steps towards the current situation.

Keywords: IFIP working group 3.4, history, activities, future.

Symposium 10.2
Curricula in Schools

Symposium 5.2 continues with presentations and discussion.

Mari Ainasoja, Mikko Ruohonen
Tampere University

City photos: Visit Tampere
Logo: Anna Colussi
Layout, design:
Manu Pärssinen / Alasin Media Oy

Printed by Grano Oy, Tampere, 2021

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