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Education and Information Technologies (EAIT) is a research journal that covers the complex relationships between Information and Communication Technologies and Education. EAIT is the official journal of the International Federation for Information Processing (IFIP), Technical Committee on Education (TC3).

The journal is embedded in the research and practice of professionals and is accepted into the Social Science Citation Index (SSCI) in the category 'Education & Educational Research', with an Impact Factor (2021) of 3.666. EAIT is now in the top quartile (Q1) of journals in Education & Educational Research.

With the educational importance internationally of coping with the COVID-19 pandemic, this issue contains a large number (eleven) of articles dealing with this topic. In looking at this though one must realise that, because of the large number of articles this journal receives, and their subsequent delay in publication, most of the articles in this issue were written in 2021 when the pandemic was at its height.

Qualitative impact assessment of COVID-19 on the pedagogical, technological and social experiences of higher education students in Taiwan describes research by Cyleen Morgan, MengChe Tsai, Chiehwen Ed Hsu, HsuehWen Chow, HowRan Guo and MengHsueh Lee (National Cheng Kung University, Tainan, Taiwan). It begins this issue. COVID-19 has imposed a rippling effect on educational institutions globally, substantially impacting nearly 1.6 billion learners in more than 190 countries. Recognizing Taiwan as atypical during this crisis, for suffering from a relatively moderate mortality/morbidity compared with the rest of the world, this paper qualitatively explores the pedagogical, technological, and social impact of COVID-19 on higher education students in Taiwan. All students demonstrated a high sense of perceived safety and reported minimal changes in their socialising norms during the pandemic.

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A structural equation model of second language writing strategies and their influence on anxiety, proficiency, and perceived benefits with online writing comes from Daniel R. Bailey (Konkuk University's Glocal Campus, Chungju, South Korea) and Norah Almusharraf (Prince Sultan University, Riyadh, Kingdom of Saudi Arabia) in which they argue that Second Language (L2) writing strategies are essential for successful learning outcomes in courses with a substantial writing component, and this is especially true during emergency remote teaching (ERT) when online writing tasks help compensate for the missing offline communication. Their study investigated the types of L2 writing strategies students employed during ERT in the midst of COVID-19 and then used structural modelling to understand how strategies relate to online writing task perceptions, L2 writing anxiety, and L2 writing proficiency.

Xieling Chena and Di Zou (The Education University of Hong Kong, New Territories, Hong Kong) and Haoran Xie (Lingnan University, New Territories, Hong Kong) then present: *A decade of learning analytics: Structural topic modelling based bibliometric analysis*. Learning analytics (LA) has become an increasingly active field focusing on leveraging learning process data to understand and improve teaching and learning, they say. Based on LA articles published during the past decade, this study explores answers to questions such as "what research topics were the LA community interested in?" and "how did such research topics evolve?" by adopting structural topic modelling and bibliometrics.

Online users require a working knowledge of password "best practice", as well as the ability to apply such knowledge, Suzanne Prior (Abertay University, Dundee, Scotland) and Karen Renaud (University of Strathclyde, Glasgow; Abertay University, Dundee, UK; Rhodes University, Grahamstown, South Africa; University of South Africa, Pretoria, South Africa) point out in *The impact of financial deprivation on children's cybersecurity knowledge & abilities*. Children increasingly operate as independent agents online, and thus also need to be aware of password "best practice". To meet this need, the Scottish curriculum for excellence includes lessons about password "best practice". To gauge its impact, they assessed the knowledge and abilities of Scottish 8–9 year old children, in four primary schools, in areas of varying financial deprivation.

A bibliometric analysis of the trends and research topics of empirical research on TPACK describes research by Di Zou, Xinyi Huang, Lucas Kohnke, Xieling Chen, Gary Cheng and Haoran Xie (The Education University of Hong Kong, Ting Kok, Hong Kong). The TPACK (technological pedagogical and content knowledge) framework is an influential theoretical foundation for teaching with technology research, and this study involves an analysis of empirical research studies of TPACK and identifies trends and research topics from 2000 to 2020 using structural topic modelling and bibliometrics. The results showed that academic interest in TPACK increased over the study period.

What critical factors forecast student-teachers utilization of online learning system in the University of Education, Ghana during the COVID-19 pandemic? is by Charles Buabeng-Andoh (University of Education, Winneba, Ghana). Online instructional system Moodle possesses some characteristics that are important for its operation in the era of the COVID-19 epidemic, but effective implementation depends

on grasping the determinants that confront the modern electronic instructional system. This inquiry examined the determinants that influence learners' operation of the instructional learning system in the period of COVID-19.

Effectiveness of using Elearning systems during COVID19 in Saudi Arabia: Experiences and perceptions analysis of engineering students by Abdulaziz S. Alkabaa (King Abdulaziz University, Jeddah, Saudi Arabia) notes that the COVID-19 epidemic has affected most countries across the globe since it was declared in December 2019 and forced most educational institutions to shift from face-to-face learning style to E-learning or distance education. This study analyses the experiences and perceptions of using Blackboard as a distance learning (online) platform.

Again, relating to COVID-19, Khalid S. Rabayah (Arab American University, Jenin, Palestine) and Nasif Amira (Ministry of Education, Ramallah, Palestine) write on *Learners' engagement assessment in e-learning during the COVID-19 pandemic: nation-wide exploration*. The purpose of their study was to determine how learners feel about distance learning as a substitute for face-to-face learning. They found that, regardless of the students' age, gender, grade, branch, or technology used, they all had a negative opinion regarding e-learning.

P. Jayanthi Nirmala, P. Sivakumar and S. Selvakumar (Alagappa University, Karaikudi, India), and R. Daphine (The American College, Madurai, India) next write on *Efficacy of technology enabled learning in science at diploma in teacher education level*. In the authors experience, technology enabled learning introduced a system of student-centred environment for learning where students' participation has become phenomenal. It has virtually revolutionized teaching and learning. The aim of this research study was to explore on effectiveness of Technology Enabled Learning in enhancing achievement in Science among D.T.Ed. (Diploma in Teacher Education) trainees.

Microgenetic analysis of written languaging attributes on form-focused and content-focused e-collaborative writing tasks in Google Docs, comes from Pooneh Kazemi, Natasha Pourdanaand Gholamhassan Famil Khalili (Islamic Azad University, Iran) and Payam Nour (Imam Khomeini International University, Qazvin, Iran). Written languaging (WL) as a facilitator of second/foreign language (L2) learning has been investigated by several researchers, but its dynamic nature episodes have remained under-researched. This study aimed to examine whether the focus of e-collaborative writing and the mediation modalities in Google Docs would have differential impacts on the attributes of WL episodes.

Integration of personality trait, motivation and UTAUT 2 to understand elearning adoption in the era of COVID19 pandemic. Hannah Vivian Osei, Kwame Owusu Kwateng and Kof Agyenim Boateng (Kwame Nkrumah University of Science and Technology, Kumasi, Ghana) note that the adoption of e-learning in response to COVID-19 is to ensure the continuous development of human capital through alternative means, but the success of e-learning systems depends much on the attitude of the users. This study developed and empirically tested a model to predict antecedents of students' actual usage of e-learning during the COVID-19 period.

Sinan Hopcan and Elif Polat (Istanbul University Cerrahpasa, Turkey) and Ebru Albayrak (, Sakarya University, Turkey) next offer: *Whether to flip Extreme Apprenticeship: which is more effective in programming instruction?* Programming

knowledge is more important than ever in the digital world. However, teaching programming can be challenging, especially with novice learners. Considerable research has been conducted into the most effective methods for teaching programming. Extreme apprenticeship, a variation of cognitive apprenticeship, is a method that has been used in teaching programming at university level in recent years. This study compares the applications of the extreme apprenticeship method, flipped extreme apprenticeship, and traditional classroom, analysing them at the university level in terms of their effects on academic achievement and engagement coupled with gender differences.

Flipped classroom in higher education: An investigation of instructor perceptions through the lens of TPACK is a study by Esma Yıldız (Amasya University, Turkey), Uğur Doğan (Sakarya University of Applied Sciences, Turkey), Özkan Özbay (Artvin Coruh University, Turkey) and Süleyman Sadi Seferoğlu (Hacettepe University, Ankara, Turkey) that was carried out by using the nested single case study design, which is a qualitative case study method, in order to determine the experiences and thoughts of the instructors about the flipped classroom method. The experiences of the instructors related to the flipped classroom were examined within the framework of Technological Pedagogical and Content Knowledge (TPACK).

An intelligent testing system development based on the shingle algorithm for assessing humanities students' academic achievements describes research performed by Saule Brimzhanova (A. Baitursynov Kostanay Regional University, Kazakhstan), Sabyrzhan Atanov and Khuralay Moldamurat (L.N. Gumilev Eurasian National University, Nur-Sultan, Kazakhstan), Botagoz Baymuhambetova (East-Kazakhstan State University, Kazakhstan), Karlygash Brimzhanova (A. Baitursynov Kostanay Regional University, Kostanay, Kazakhstan) and Aitkul Seitmetova (International Kazakh-Turkish University, Kazakhstan). Computer-based testing of humanities students has some inconveniences and difficulties, where the whole learning process is practically based on communicative methods. A testing system, which would allow one to ask open-ended questions, and students would be able to enter detailed answers is needed. The aim of this study was to develop an intelligent testing system based on the shingle algorithm in assessing the academic achievements of humanities students. Taking into account that during testing humanities, students will formulate answers of their own understanding, the developed system should be able to determine the degree of their identity to the correct answer.

English student teachers' behavioural intention to use information and communication technologies by Esra Harmandaoğlu Baz (Ankara Music and Fine Arts University, Ankara, Turkey) and Paşa Tevfik Cephe (Gazi University, Ankara, Turkey) tests a model investigating the contribution of computer self-efficacy, computer anxiety, constructivist teaching beliefs, and computer attitude to predicting English student teachers' behavioural intention to use ICT in their future classes. Computer self-efficacy, computer anxiety, computer attitude, and constructivist teaching beliefs were respectively found significant in the I-PredICT model.

João Mattar (Pontifícia Universidade Católica de São Paulo and Universidade Santo Amaro, São Paulo, Brazil), Daniela Karine Ramos (Universidade Federal de Santa Catarina, Florianópolis, Brazil) and Margarida Rocha Lucas (Universidade de Aveiro, Aveiro, Portugal) then offer: *DigComp-Based Digital competence Assess-*

ment Tools: Literature Review and Instrument Analysis. The purpose of their study was to compare digital competence assessment instruments based on DigComp related frameworks. It aimed to answer four questions: (a) What types of instruments based on these frameworks are available? (b) How were these instruments created from these frameworks? (c) What procedures were used to guarantee the validity and reliability of these instruments? (d) In what ways are the data collected by these instruments analysed and used?

The next article reports a study to explore the computational thinking (CT) processes of university students with the integration of CAS and ACODESA method within the context of problem-solving. *Using Habermas' construct of rationality to analyse students' computational thinking: The case of series and vector* is by Selin Urhan (Hacettepe University, Ankara, Turkey). The participants were university students, and embedded design was used in the study. The qualitative data consists of the written products of the students, the Maple files, and the transcriptions of argumentations while the quantitative data consists of the pre and post-test scores of the students in CT practices. The implementation was based on ACODESA method. Pre and post-test scores were compared through the Wilcoxon signed-rank test.

Understanding the impact of quality elements on MOOCs continuance intention is an article by Shang Shanshan and Lyv Wenfei (Shanghai International Studies University, China). Online learning has captured much attention, but the high dropout rate of MOOCs is now a topic of concern critical in both research and practice. From teaching-based quality and platform-based quality perspectives, this study investigates the impact of quality elements on continuance intention based on Expectation Confirmation Model, Task Technology Fit, flow theory and trust.

Cyberbullying (CB) is one of the severe misconducts on social media. Many CB detection systems have been developed for many natural languages to face this phenomenon. Fatima Shannag (The University of Jordan, Amman, Jordan), Bassam H. Hammo (The University of Jordan, Amman, Jordan and Princess Sumaya University for Technology, Amman, Jordan) and Hossam Faris (The University of Jordan, Amman, Jordan and Al Hussein Technical University, Amman, Jordan) address this in: *The design, construction and evaluation of annotated Arabic cyberbullying corpus*. This paper discusses the design, construction, and evaluation of a multi-dialect, annotated Arabic Cyberbullying Corpus (ArCybC), that is a valuable resource for Arabic CB detection and motivation for future research in Arabic Natural Language Processing (NLP). The study describes the phases of ArCybC compilation.

Twentyfive years of education and information technologies: Insights from a topic modelling based bibliometric analysis is by Ozcan Ozyurt and Ahmet Ayaz (Karadeniz Technical University, Trabzon, Turkey). Education and Information Technologies (EAIT) has been a leading journal in education & educational research since 1996. To celebrate its 25th anniversary and provide a comprehensive overview of the field, a topic modelling-based bibliometric analysis was conducted on the articles published in this journal. The study is constructed upon two methods, bibliometric analysis, and topic modelling. The study aimed to find out the trends in publications and citations, prominent countries, affiliations and the status of authors, the prominent topics, and the thematic characteristics of these topics, as well as research interests and trends.

Virtual Laboratories – A historical review and bibliometric analysis of the past three decades by Raghu Raman, Krishnashree Achuthan, Vinith Kumar Nair and Prema Nedungadi (Amrita Vishwa Vidyapeetham, Amritapuri, India) notes that online and virtual teaching–learning has been a panacea that most educational institutions adopted from the dire need created by COVID-19. They provide a comprehensive bibliometric study of 9523 publications on virtual laboratories in higher education covering the years 1991 to 2021. Influential bibliometrics such as publications and citations, productive countries, contributing institutions, funders, journals, authors, and bibliographic couplings were studied using the Scientific Procedures and Rationales for Systematic Literature Reviews (SPAR-4-SLR) protocol.

The next study investigates the quality of tasks containing the use of dynamic geometry software (DGS) in the middle (5th −8th grade) and secondary school (9th −12th grade) mathematics textbooks in terms of mathematical and technological aspects. It is by Fadime Ulusoy and İsmail Batuhan Turuş (Kastamonu University, Turkey) – ***The mathematical and technological nature of tasks containing the use of dynamic geometry software in middle and secondary school mathematics textbooks***. The DGS-related tasks in twenty-seven Turkish mathematics textbooks, approved by the Ministry of National Education, were analysed according to the Dynamic Geometry Task Analysis Framework.

Teachers' use of ICT in the preschool period: A mixed research method by Sema Öngören (Nevşehir Hacı Bektaş Veli University, Turkey) argues that this plays a key role in making the learning process easier and more effective. The study aimed to investigate the use of information and communication technologies (ICT) by teachers in the preschool period with an explanatory sequential design, which is one of the mixed research methods. The research showed that teachers' ICT use was high. According to the variable of teachers' participation in in-service training, it was determined that the use of ICT created a significant difference in favour of the teachers participating in the training.

An integrated curriculum of virtual/augmented reality for multiple design students was written by Tarek Ismail Mohamed (Ajman University, United Arab Emirates) and Andreas Sicklinger (University of Bologna, Italy). This paper provides a careful examination of case studies in literature and consideration of utility for the profession through a curriculum of virtual and augmented reality technologies with specifications that suit multiple areas of design (product and graphic design). Their approach demystifies these new technologies from the design process to product marketing.

Quantitative analysis of Chinese classroom teaching activity under the background of artificial intelligence is from Ying Yuan (Xinyang College, Henan Province, China). To understand the real situation of classroom teaching under the environment of information technology and the problems existing in the integration of information technology and curriculum in actual classroom teaching, this paper takes multimedia, interactive electronic whiteboard and Moodle platform as the research and analysis object and uses ITIAS (Information Technology-based Interaction Analysis System) to describe the real situation of classroom teaching.

Rahul Pandey, Hemant Purohit and Aditya Johri (George Mason University, Fairfax, USA) then offer: ***VUER: A model for rating videos to curate content for learn-***

ing. Videos are an engaging medium for learning as they provide affordances beyond text or audio-only, thereby allowing the creator more flexibility for content generation, and easy access to videos on the Web and their popularity within everyday discourse has made them an accepted medium for teaching and learning, they point out. This increase in the availability of videos makes it challenging for an instructor, teacher, or learner to assess their viability for learning. In this paper they present and test a theoretically motivated model to rate videos on their potential to support learning goals. Visual Appeal, Understanding of Content, Engagement with Topic, and Recommendation Preference (VUER) are the four components of our proposed model.

Electronic learning benefits and challenges in Malawi's higher education: A literature review by Limbani Chrispin Gama, George Theodore Chipeta and Winner Dominic Chawinga (Mzuzu University, Mzuzu City, Malawi) notes that e-learning has become inevitable for higher education institutions during the Corona Virus pandemic. This paper presents a systematic literature review on e-learning in Malawi's higher education institutions with comparable analysis from findings in other developing countries across the globe, with the aim to highlight some benefits and challenges of implementing a sustainable e-learning programme in higher education institutions.

Muhlise Coşgun Ögeyik (Trakya University, Edirne, Turkey) then writes on: ***Using Bloom's Digital Taxonomy as a framework to evaluate webcast learning experience in the context of COVID19 pandemic***. Distance education has been the concern of educational institutions due to COVID-19 pandemic, and the purpose of this study, carried out during COVID-19 pandemic lockdown period in 2020, was to evaluate the effectiveness of webcast applications on teacher training. Since it was a sudden and an unpredicted transition from face-to-face education to webcast education, it was crucial to evaluate the outcome of teaching applications to compensate for the missing points in education.

In recent years, the interest in the use of serious games as teaching and learning tools in traditional educational processes has increased significantly, Ibtissem Daoudi (University of Manouba, Tunisia) points out in: ***Learning analytics for enhancing the usability of serious games in formal education: A systematic literature review and research agenda***. Serious Educational Games (SEG) and Learning Analytics (LA) are gaining increasing attention from teachers and researchers, since they can both improve the learning quality. This article examines, summarises, and characterises the current state of the art related to the application of LA to SEGs through a systematic literature review based on a methodological instrument called PRISMA.

Ezechiel Nsabayezu, Aloys Iyamuremye, Valentine Urengejeho, Janvier Mukiza, Fidele Ukobizaba, Agnes Mbonyiryivuze and Jean de Dieu Kwitonda (University of Rwanda-College of Education, Kayonza, Rwanda) write on: ***Computerbased learning to enhance chemistry instruction in the inclusive classroom: Teachers' and students' perceptions***. Their article reports on teachers' and students' perceptions to enhance the teaching and learning of chemistry in inclusive classrooms. It investigates how students with visual and those with hearing disabilities can easily access chemistry instructions.

Using design science research to propose an IT governance model for higher education institutions was contributed by Aline Rossales Sengik and Guilherme Lerch Lunardi (Federal University of Rio Grande, Brazil), Isaías Scalabrin Bianchi and Guilherme Costa Wiedenhöft (Open University of Brazil, Federal University of Santa Catarina, Florianópolis, Brazil). They argue that increasing use of, and dependence on, IT to support operational teaching, research, and management activities in Higher Education Institutions (HEI) – mainly due to their multi-unit organisational structure – have evidenced the need of encouraging managers to focus more on IT Governance (ITG) effectiveness, which has been an issue for many of these institutions. Because of this, they developed a specific ITG model for Higher Education Institutions, by following the methodological principles of Design Science Research.

The next research was carried out to survey virtual instructional competence among tourism teachers in secondary schools in Calabar South Local Government Area, Nigeria. *A survey of virtual instructional competence among tourism teachers in secondary schools, Calabar South local Government Area, Nigeria* was written by Idongesit Emmanuel Ephraim, Benjamin Ayua Ambe, Bassey Obeten Udumo, Nkanu Usang Onnoghen, Eturki Eborty Egbonyi, Remi Modupe Omoogun, Moses InyangAbia, Fidelis Abunimye Unimna and Helen Pius Okon (University of Calabar, Nigeria). This research was carried out to survey virtual instructional competence among tourism teachers in secondary schools in this area. Five research questions and one hypothesis were posed to assess virtual instructional competence variables.

Learning outcomes assessment is an effective academic quality assurance tool that enables educators to review and enhance the alignment between planned, delivered, and experienced curricula, write Walid Ibrahim, Wissam Ibrahim, Taoufk Zoubeidi, Sayed Marzouk, Amr Sweedan and Hoda Amer (United Arab Emirates University, Al Ain, UAE) in their article: *An Online Management System for Streamlining and Enhancing the Quality of Learning Outcomes Assessment*. Accurately assessing what students know and are able to do after completing a learning module is the first step to decide on the strategies to implement and the proper actions to take in order to ensure the continuous improvement of the student learning experience. This paper discusses the main issues that affect the implementation of the assessment process and prevent the closure of the assessment loop.

Automatic content analysis of asynchronous discussion forum transcripts: A systematic literature review, come from Mubarik Ahmad, Kasiyah Junus and Harry Budi Santoso (Universitas Indonesia, Jawa Barat, Indonesia). In recent years, the use of asynchronous discussion forums in online learning has increased rapidly and content analysis is the most-used research method in exploring the discussion transcripts. However, conventional content analysis is a time-consuming task and requires experienced coders. There is a need for an automated approach to analyse the online discussion transcripts to help instructors optimise the learners' learning experiences. This article presents a systematic literature review on the automated content analysis approach in online discussion transcripts.

Do prosocial video games promote moral activity?: an analysis of user reviews of Papers, Please write Beatriz Cabellos and JuanIgnacio Pozo (Autonomous University of Madrid, Spain), Kevin MarínRubio (Universitat Oberta De Catalunya, Barcelona, Spain) and Daniel L. Sánchez (Autonomous University of Madrid, Spain).

Video games are the digital entertainment resource most in demand by young people, which has led an increasing number of education experts to study their possible benefits. This research set out to identify the potential of 'Papers, Please' to promote moral learning. 'Papers, Please' is a video game where you adopt the role of a customs inspector in a totalitarian state who must obtain the necessary money to fund their family. The article tries to identify those objectives that go beyond the success in the video game and could favour moral learning.

Erhan Ünal and Ahmet Murat Uzun (Afyon Kocatepe University, Turkey) and Selcan Kilis (Giresun University, Turkey) then write: ***Does ICT involvement really matter? An investigation of Turkey's case in PISA 2018***. This study investigates how Turkish students' involvement in ICT predicts their maths and science performance in the 2018 Programme for International Student Assessment (PISA) test. The research also tested demographic variables including socioeconomic status (SES) and gender as covariates.

Architectural design game: A serious game approach to promote teaching and learning using multimodal interfaces was written by Amir Goli, Fatemeh Teymournia and Maedeh Naemabadi (Pars University, Tehran, Iran) and Ali Andaji Garmaroodi (University of Tehran, Iran) in which they introduce and develop an educational tool as an interactive digital game for architectural design, allowing the architectural students to challenge their knowledge and experiences. The framework of this educational tool supports a serious open-ended game, which helps students get involved through self-assessment and a multi-modal natural user interface, including gesture recognition and speech recognition in a familiar CAD environment without any right or wrong solutions.

Ram B. Basnet and Clayton Johnson (Colorado Mesa University, Grand Junction, CO, USA) and Tenzin Doleck (Simon Fraser University, Burnaby, BC, Canada) next present: ***Dropout prediction in MOOCs using deep learning and machine learning***. Innovative application of educational analytics has gained momentum. Indeed, predictive analytics have become increasingly salient in education. Although prior literature on educational big data recognises the utility of deep learning and machine learning methods, little research examines both deep learning and machine learning together, and the differences in predictive performance have been relatively understudied. This paper presents a comprehensive comparison of predictive performance using deep learning and machine learning. Specifically, it uses educational big data in the context of predicting dropout in MOOCs.

Sheunghyun Yeo (The University of Alabama, Tuscaloosa, AL, USA), Teomara Rutherford (University of Delaware, Newark, Delaware, USA) and Tye Campbell (Crandall University, Moncton, New Brunswick, Canada) write about ***Understanding elementary mathematics teachers' intention to use a digital game through the technology acceptance model***. Teachers' attitudes and beliefs play an important role in their integration of digital games in the classroom, and thus the transformative potential of game-based learning. In this study, the authors adapt the Technology Acceptance Model to examine elementary teachers' acceptance of a digital mathematics game and investigate antecedents to their intention to use the game to teach mathematics.

Determining teacher candidates' levels of twentyfirst century learner and teacher skills use comes from Derviş Paşa and Cigdem Hursen (Near East University, Nicosia, Cyprus) and Hafze Keser (Ankara University, Turkey). Their study aimed to determine the levels of skill use of teacher candidates studying in Northern Cyprus, and to determine the relationship between the teacher candidates' levels of using their learner and teacher skills. The results obtained from the study revealed that gender made a significant difference in terms of teacher candidates' use levels of cognitive, autonomous, administrative, technopedagogical, affirmative, and generative skills.

Accuracy comparison between statistical and computational classifiers applied for predicting student performance in online higher education was contributed by Rosa Leonor Ulloa Cazarez (Universidad de Guadalajara, Mexico). Educational institutions abruptly implemented online higher education to cope with sanitary distance restrictions in 2020, causing an increment in student failure. This negative impact attracts the analyses of online higher education as a critical issue. The early identification of students at risk is a strategy to cope with this issue by predicting their performance. This work describes two experiments using student grades of an online higher education program to build and apply three classifiers to predict student performance.

Iuliia Sergeevna Khukalenko (Far Eastern Federal University, Vladivostok, Russia), Regina Kaplan-Rakowski and Yunjo An (University of North Texas, Denton, TX, USA) and Vera Dmitrievna Iushina (Western Sydney University, Sydney, Australia) next write on: ***Teachers' perceptions of using virtual reality technology in classrooms: A large-scale survey***. High-immersion virtual reality (VR) technology is often associated with gaming but is increasingly popular in educational contexts due to its potential to engage and motivate learners. Prior to VR technology integration in the classroom, the acceptance or resistance toward VR needed to be explored, and this paper reports the results obtained from a large-scale survey on teachers' attitudes toward the use of VR for education. The survey explored the relationships between the teachers' VR integration level and their instructional approaches, as well as the frequency of VR use.

Programming skills (PS) are indispensable in the information age, but current research on PS cultivation mainly focuses on teaching methods and lacks analysis of program features to explore the differences in learners' PS and guide programming learning, write Wei Zhang, Xinyao Zeng, Jihan Wang, Daoyang Ming and Panpan Li (Central China Normal University, Wuhan, China) in their article: ***An analysis of learners' programming skills through data mining***. The purpose of their study was to explore horizontal differences and vertical changes in PS of learners aged 18 to 25 and to facilitate the discovery of programming features and behaviours to guide the acquisition of PS through an experiment of statistical analysis and cluster analysis of 2,400 Python programs in four programming tasks.

Development and validation of an instrument to measure undergraduate students' attitudes toward the ethics of artificial intelligence (ATEAI) and analysis of its difference by gender and experience of AI education. This article was written by Yeonju Jang and Seongyune Choi (The Graduate School of Korea University, Seoul, Republic of Korea) and Hyeoncheol Kim (Korea University, Seoul, Republic of Korea). They point out that as artificial intelligence (AI) becomes more prevalent,

so does the interest in AI ethics. To address issues related to AI ethics, many government agencies, non-governmental organisations (NGOs), and corporations have published AI ethics guidelines, but only a few test instruments have been developed to assess students' attitudes toward AI ethics. In this study, they developed and validated an instrument (AT-EAI) to assess undergraduate students' attitudes toward AI ethics.

Since the outbreak of COVID-19, online learning has gained popularity among educators and learners, where Community of Inquiry (CoI) has caught researchers' attention. Zhonggen Yu and Ming Li (Beijing Language and Culture University, China) amplify on this in: ***A bibliometric analysis of Community of Inquiry in online learning contexts over twenty-five years***. To bibliometrically analyse the framework of CoI over this period, they adopted both qualitative and quantitative research methods to examine the framework of CoI in online learning contexts. This study also explored the top ten authors, sources, organisations, and countries using VOSviewer and established citation networks through the clustering techniques in CitNetExplorer.

Computational thinking: early childhood teachers' and prospective teachers' preconceptions and self-efficacy by Canan Avcı and Mine Nur Deniz (Ondokuz Mayıs University, Samsun, Turkey) argue that the most efficient way to make students acquire these skills is to incorporate Computational Thinking (CT) into K-12 education. Computational thinking is considered a group of problem-solving skills that the next generations are expected to possess, and various education programs have been designed to improve teachers' and prospective teachers' competence in CT. Such programs, designing educational experiences based on teachers' and prospective teachers' pre-existing opinions and self-efficacy perceptions about CT, could achieve better results. The reported exploratory study aimed to examine early childhood teachers' and prospective teachers' preconceptions and self-efficacy about CT.

Jianhui Yu and Changqin Huang (Zhejiang Normal University, Jinhua, China), Tao He (South China Normal University, Guangzhou, China), Xizhe Wang and Linjie Zhang (Zhejiang Normal University, Jinhua, China) next write on: ***Investigating students' emotional selfefficacy profiles and their relations to selfregulation, motivation, and academic performance in online learning contexts: A personcentred approach***. Emotional self-efficacy is a vital component in student academic engagement and performance, but few studies have identified emotional self-efficacy profiles from a person-centred perspective and examined their relations to self-regulation, motivation, and academic performance in online learning environments. To address this the authors performed latent profile analysis on a dataset of students and identified four profiles: low, average, above average with a low ability to handle the emotions of others, and high emotional self-efficacy profiles.

Size matters: contextual factors in local policy translations of National School Digitalisation Policy, is an article by Ulrika Gustafsson (Umeå University, Sweden). National policies on school digitalisation take shape in their local contexts and so to understand the outcome of national policy the local translations must be set within a contextual perspective. This article explores how four contextually different municipalities in Sweden translate national school digitalisation policy. It draws on a comparative cross-case study with data gathered from interviews, and over 150 local documents dating from 2018 to 2020.

Francisco Javier GilEspinosa, Adriana NielsenRodríguez and Ramón Romance (Universidad de Málaga, Spain) and Rafael Burgueño (University of Almeria, Spain) next discuss *Smartphone applications for physical activity promotion from physical education*. The authors point out that smartphone apps are thought to be an adequate instructional strategy not only to improve the quality of the teaching in physical education (PE), but also to effectively promote leisure-time physical activity (PA) of adolescent students in this context. The aim of their research was to conduct a systematic search for smartphone apps focused on PA and sport; to assess the features, content and quality of every included smartphone app; and to analyse the relationships between these and the secondary PE curriculum.

The Association between Flipped Learning Readiness, Engagement, Social anxiety, and Achievement in Online Flipped Classrooms: a Structural Equational Modelling is an article by Elif Polat and Sinan Hopcan (Istanbul University – Cerrahpasa, Turkey) and Tuğba Kamalı Arslantaş (Aksaray University, Turkey). This study explores the association between flipped learning readiness (FLR), engagement, social anxiety, and achievement in online flipped classrooms among university students enrolled in an information technology course. Their results showed that engagement and FLR were positively associated with student achievement, whilst there was a negative association between social anxiety and achievement in the online flipped classroom.

As a learner-centred approach, technology-facilitated personalised learning has received increasing attention, but it is unclear whether this is effective for both learning achievements and learning perceptions, write Lanqin Zheng, Miaolang Long, Lu Zhong and Juliana Fosua Gyasi (Beijing Normal University, China) in their article: *The effectiveness of technologyfacilitated personalized learning on learning achievements and learning perceptions: a metaanalysis*. This study aimed to close the research gaps and examine the effect sizes of technology-facilitated personalised learning on learning achievements and learning perceptions. From 2001 to 2020, 34 empirical studies were synthesized in the meta-analysis.

Internet use and academic performance: An interval approach describes research by María Ladrón de Guevara Rodríguez, Luis Alejandro LopezAgudo, Claudia PrietoLatorre and Oscar David MarcenaroGutierrez (Universidad de Málaga, Spain). They point out as children spend more and more time on electronic devices and social networks, there is a growing concern about the influence that these activities may have on their development and social well-being. The research they describe was aimed at analysing the influence that Internet use may have on 6th grade primary school students' academic performance in Spain.

Investigating the effect of peer instruction on learners with different cognitive styles in VRbased learning environment describes a study by Zheng Zhong, Guoliang Zhang, Shuaizhen Jin, Jun Wang, Ni Ma and Sijia Feng (Central China Normal University, Wuhan, China). Immersive Virtual Reality (IVR) offers simulated learning experience but could bring about higher cognitive load and be less accommodating to different cognitive styles, they argue. Whereas Peer Instruction (PI), when integrated into an IVR-based course, has the potential to address the needs of different cognitive styles and reduce cognitive load. This study explored the effects

of PI in IVR-based course on learners, especially with two cognitive styles, namely Field-Independent (FI) and Field-Dependent (FD).

Also from China, Wangyu Tong (Hubei University of Technology, Wuhan, Hubei, China), Youxue Wang, Qinghua Su and Zhongbo Hu (Yangtze University, Jingzhou, Hubei, China) write on: ***Digital twin campus with a novel doublelayer collaborative filtering recommendation algorithm framework***. Compared with the application of Digital Twin (DT) in the industrial field, the application of DT in the field of education is still in its infancy. In this paper, a Digital Twin Campus (DTC) for teaching and learning is proposed. It is argued that DTC possesses two characteristics: that DTC has a wide variety of employment orientations for students or teachers, and teaching-learning resources in DTC system are huge but divisible. This paper proposes a Double-layer Collaborative Filtering Algorithm Framework (DCFAF) to recommend teaching-learning objects for digital twin teachers or students in DTC.

Evaluation of computerized school selection and placement system in Ghana using ft and viability theory is a paper by Acheampong Owusu and Joshua Nii Akai Nettey (University of Ghana Business School, Accra, Ghana). ICT advancement has led to the digitization of school selection and placement systems in Ghana: a developing economy. In 2005 the Ghana Education Service (GES) introduced the Computerised School Selection and Placement System (CSSPS) to improve selection and placement transparency and equity of Basic Education Certificate Examination (BECE) candidates into Second-Cycle Schools (SCSs), and to reduce the number of human errors connected with the manual system of BECE candidate selection and placement.

The last article in this issue: ***A mobile learning framework for higher education in resource constrained environments*** is by Safya OkaiUgbaje (University of Canberra, Bruce, Australia), Kathie Ardzejewska (The University of Notre Dame, Sydney, Australia) and Ahmed Imran (University of Canberra, Bruce, Australia). Mobile technology (m-learning) holds great potential to enhance technology-enhanced learning in countries and communities with low socio-economic conditions where web-based e-learning has failed because of limited infrastructure and resources, but despite this its actual uptake has been low. This paper presents an m-learning framework that considers the sociocultural and socio-economic contexts of low-income economies.

Like each issue in the last few years, EAIT again displays its truly international character with articles in this issue coming from researchers in: Australia, Brazil, Canada, China, Cyprus, Ghana, Hong Kong, India, Indonesia, Iran, Italy, Jordan, Kazakhstan, Korea, Malawi, Mexico, Nigeria, Palestine, Portugal, Rwanda, Saudi Arabia, South Africa, Spain, Sweden, Taiwan, Tunisia, Turkey, UK, UAE and USA.

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