Editorial for EAIT issue 5, 2020

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Education and Information Technologies (EAIT) is the official journal of the Technical Committee on Education (TC3) of the International Federation for Information Processing (IFIP). It covers the complex relationships between information and communication technologies and education, from the micro of specific applications or instances of use in classrooms to macro concerns of national policies and major projects; from classes of five year olds to adults in tertiary institutions; from teachers and administrators, to researchers and designers; from institutions to open, distance and lifelong learning. The journal's breadth of coverage allows EAIT to examine fundamental issues at all levels, discuss specific instances and cases, draw inference and probe theory. This journal is embedded in the research and practice of professionals.

While the pandemic and lock-down appears to be having a profound effect on education with many schools and universities around the world offering only online teaching, the editors believe that at present there has not been sufficient time to identify and research all the factors that the COVID-19 crisis might have introduced into education. While many of the writings published in newspapers and other journals so far are interesting they are not, and cannot be characterised by depth or perspective. There has not been enough time for educators to identify and conduct empirical research studies that integrate technology design accommodating all the factors and complexities that the COVID-19 crisis introduced into education. Much of what has been written so far is descriptive or conceptual. Ideas need to be reinforced by experimental practice to analyse and validate, and formal and well-founded research studies are needed. EAIT will be offering a Special Issue on this subject later this year (deadline for submissions of 31st January 2021). You can find details of this (later this year) at <https://www.springer.com/journal/10639> - Journal Updates, View all Updates. Keep a close watch on this and offer a well-researched article in a few months.

To begin this issue we have an article from Sheshadri Chatterjee and Kalyan Kumar Bhattacharjee (Indian Institute of Technology Delhi, India) titled: *Adoption of artificial intelligence in higher education: a quantitative analysis using structural equation modelling*. The authors point out that the application of Artificial Intelligence (AI) in

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higher education in India has opened new possibilities and challenges and will bring in effective change of governance in Indian Institutes of higher education. AI could be used in investigation of educational applications: how teachers would enrich them, how students would learn, and how accurate and prompt decisions can be taken. The purpose of the reported study was to explore how the stakeholders would be able to adopt AI, and the researchers made use of adoption theories and models including ‘Unified Theory of Acceptance and Use of Technology’ (UTAUT). They found that this model could help authorities to facilitate adoption of AI in higher education.

Prospective middle school mathematics teachers’ points of view on the flipped classroom: The case of Turkey by Emine Özgür Şen and Kevser Hava (Yozgat Bozok University, Turkey). Their research involved a study in an 11 week Statistics and Probability course. Their findings were organized under four themes as positive opinions, negative opinions, suggestions and the use of flipped classrooms in mathematics teaching. They found that flipped classrooms had positive effects on prospective teachers’ active participation in lessons, self-regulation and teamwork skills. They also found that not making any revision of the subjects during the course as well as technical problems were the negative sides of the flipped classroom. They propose that Kahoot activities could be a useful way to make sure all students watch lecture videos before the class. It was found that prospective teachers had different opinions on the use of flipped classrooms in mathematics teaching.

Critical success factors influencing the adoption of digitalisation for teaching and learning by business schools. This research was authored by: Ritu Gupta (Jain School of Global Management, Mumbai, India), A. Seetharaman and K. Maddulety (SP Jain School of Global Management, Dubai, United Arab Emirates, Singapore, and Australia). They note that gaining an understanding of these variables will help business schools adopt digitalisation for long-term improvement. From the literature they identified eight independent variables that can influence the adoption of digitalisation in business schools and conducted a worldwide survey and developed a conceptual model using a structural equation model in ADANCO 2.0.1, which they used to postulate the hypotheses. Empirically, students’ competence has the strongest influence on the adoption of digitalisation by business schools, followed closely by teachers’ competence and technology diffusion, but industry expectations did not have significant influence.

With the integration of popular technologies such as social media, smartphones and tablets in the education system, new online course delivery methods such as flipped classrooms have emerged to enhance teaching and learning and Ibrahim Arpacı and Gulsah Basol (Tokat Gaziosmanpaşa University, Turkey) next offer: ***The impact of preservice teachers’ cognitive and technological perceptions on their continuous intention to use flipped classroom.*** To understand implications of the integration of such technologies in education, preservice teachers took their regular classes on a flipped classroom during a semester, then completing a survey instrument adapted for this study to measure their continuous intention to use flipped classroom. The research model, based on the technology acceptance model and social cognitive theory, was tested by employing a structural equation modelling approach. Results indicated that self-regulation and self-efficacy have a positive impact on perceived ease of use (PEOU), whereas perceived anxiety has a negative impact on PEOU and self-efficacy.

Mohammed Nasiru Yakubu (American University of Nigeria), Salihu Ibrahim Dasuki (The University of Sheffield, UK), A. Mohammed Abubakar (Antalya Bilim University,

Turkey) and Muhammadou M. O. Kah (American University of Nigeria) note that research has shown that technology, when used prudently, has the potential to improve instruction and learning both in and out of the classroom. In their article: ***Determinants of learning management systems adoption in Nigeria: A hybrid SEM and artificial neural network approach*** they point out that only a handful of African tertiary institutions have fully deployed learning management systems (LMS), and that the literature is devoid of research examining the factors that foster the adoption of LMS. Their research showed that social influence, facilitating conditions, system quality, perceived ease of use and perceived usefulness are important predictors for students' behavioural intention to use LMS which also functions as a predictor for actual usage of LMS.

The next article: ***The impact of an adaptive e-course on students' achievements based on the students' prior knowledge*** by Elham Alsadoon (King Saud University, Saudi Arabia) notes that researchers emphasize that prior knowledge is one of the important factors that influence learning. This study discusses the design and implementation of adapting an e-course to students' prior knowledge using the Learning Management System and investigates the impact of such an adaptive e-course on the learner's prior knowledge through their achievement. They used an experimental group whose learning involved using an adaptive e-course to compare with another group taught using traditional teaching methods. Findings of the study show that the experimental group outperformed the control group in academic achievement and that activating relevant prior knowledge offered to the beginner learners helped in minimizing the performance gap between them and their advanced peers.

A case study investigating programming students' peer review of codes and their perceptions of the online learning environment is offered by Roshni Sabarinath and Choon Lang Gwendoline Quek (National Institute of Education, Nanyang Technological University, Singapore). They remark that programming in schools is no longer a novel subject but is now quite commonly found in either in formal or informal curriculum. Learning to program is generally considered challenging, and developing and implementing new methodologies in teaching programming is imperative to overcome the current challenges associated with teaching and learning of programming. Their reported case study aimed to contribute to programming education in schools by investigating how students learn online while involved in peer review of codes. The study subsequently examined students' perceptions of the pedagogical, social and technical design of the online programming learning environment.

The effectiveness of using interactive white boards in improving the Arabic listening skills of undergraduates majoring in Arabic language at Kuwait universities is by Mohammad D. Aldhafiri (Kuwait University). He remarks that a review of the literature indicates that interactive whiteboards support language learning as well as improving students' achievement listening skills and motivation in schools. The study sample of 60 male students was divided into two groups; one using interactive whiteboards and the other not, the aim being to determine the effect on Arabic listening skills. The finding of the study indicated significant differences between the groups showing that the use of interactive white board strategy showed better improvement among the students than the use of the traditional method. The study concludes with recommendations for future research in different contexts.

Mukai Turugare (Botho University, Lesotho) and Norman Rudhumbu (Bindura University of Science Education, Zimbabwe) note that technology is considered a

critical tool in enhancing teaching and learning in universities as its ubiquitous nature allows students to access education from anywhere, at any time and at their own pace. In their article: *Integrating technology in teaching and learning in universities in Lesotho: opportunities and challenges* they relate a study to investigate the extent to which universities in Lesotho have integrated technology in teaching and learning and also to identify factors that act as challenges and opportunities to effective integration technology in the universities. Results of the study showed that the level of integration of technology into teaching and learning is overall not high, and learning management systems, projectors, computers and online activities are being used to support IT integration.

The next article presents a report to evaluate the time individuals spent in reading using the 6-dot braille code versus the 8-dot braille code and is discussed in the context of assistive technology, reading comprehension, and literacy skills. It comes from Vassilios Argyropoulos (University of Thessaly, Greece), Georgios Sideridis (University of Athens, Greece), Magda Nikolaraizi (University of Thessaly, Greece), Aineas Martos (National and Kapodistrian University of Athens, Greece), Suzana Padeliadu (Aristotle University of Thessaloniki, Greece), Konstantinos Gkyrtis (Vocational School of Athens, Greece) and Sofia-Marina Koutsogiorgou (Special Technical Vocational School, Greece). It is titled: *Refreshable braille displays and reading fluency: A pilot study in individuals with blindness*. Twenty individuals with blindness participated in a series of experiments using refreshable braille displays where each participant was invited to read structured texts by touch and then to answer reading comprehension questions. Each text had different font style (such as bold, italic, underline) and was rendered differently by the 6-dot and 8-dot braille code. Results indicated that the participants dedicated less time in reading texts through the 6-dot braille code rather than reading equivalent texts via the 8-dot braille code, but needed significantly more time to answer reading comprehension questions when they read the texts via the 6-dot compared to the 8-dot braille system.

Atul Sajjanhar (Deakin University, Australia), Kenneth Y. T. Lim (National Institute of Education, Singapore) and Yuechao Ren (Deakin University, Australia) propose, through innovative use of technology, a pedagogical framework to improve the achievement of the threshold learning outcomes defined for Australian curriculum in environmental science. This article is: *Pedagogical framework for environmental science*. The framework is grounded in the theory of disciplinary intuitions and aims to improve understanding of the local environment through assessment of microclimates, thereby developing increased understanding of complex environmental issues, and promote systemic change in environmental science education by engaging students in novel and authentic tasks. Their proposed framework seeks to make environmental factors immediately relevant to students through study of their local environment.

Virtual tutor and pupil interaction: A study of empathic feedback as extrinsic motivation for learning by Ali Oker (University of Reims Champagne-Ardenne, France), Florian Pecune (University of Glasgow, UK) and Christelle Declercq (University of Reims Champagne-Ardenne, France) argue that virtual tutors are a promising technology, providing a rich interactive environment for children to learn in, but that how they should behave in order to enhance pupils' motivation remains unanswered. Using an embodied conversational agent platform, they tested human-computer interactions with 22 children years where they performed several numeracy

exercises set by two different virtual agents, one providing solely verbal feedback (unimodal), while the other combined facial expressions based on real muscle contractions with its verbal feedback (bimodal). Results showed that the overall duration of agent-pupil interactions varied, but children found the bimodal agent more empathic and produced significantly more correct answers.

Research in the field of collaboration in Virtual Learning Communities (VLCs) has mainly focused on learning and social interactions, and research related to cyberbullying mainly refers to a social media context. ***Virtual learning communities (VLCs) rethinking: Collaboration between learning communities*** by Stefanos Nikiforos (Ionian University, Greece), Spyros Tzanavaris (Aristotle University of Thessaloniki, Greece) and Katia-Lida Kermanidis (Ionian University, Greece) examines bullying behaviour through the collaboration process between learning communities. In their research, two K-12 learning communities, one Virtual Learning Community and one Physical Learning Community that extended its hypostasis to the web, collaborated through the Wikispaces web-based collaborative platform in order to implement a cultural project. Taking into account the main aspects of the sociocultural learning theories, the collaboration process between the two communities was analysed, examining the dialogues exchanged and the artefacts created. This focused on detection of aggressive behaviour (bullying), the teacher's role and the inner speech.

Self-regulated learning strategies and non-academic outcomes in higher education blended learning environments: A one decade review describes research by Lilian Anthonysamy, Ah-Choo Koo and Soon-Hin Hew (Multimedia University, Cyberjaya, Malaysia). Although university students use their digital devices for almost everything, current studies shows that students have difficulties with digital learning because they lack in self-regulated skills which in return lead to low performance. Self-regulated learning strategies (SRLS) are used to assist students to learn efficiently, but while much research has investigated SRLS towards academic outcomes such as grades, little is known about the use of SRLS towards non-academic outcomes that are also essential to assist university students' learning progression. This paper uses a systematic review methodology to explore the current literature on how best to utilise SRLS to drive positive non-academic outcomes in digital learning within a blended learning environment. Results revealed that generally, SRLS positively correlate with non-academic outcomes.

The next article: ***ICT policy implementation in higher education institutions in Namibia: A survey of students' perceptions*** was contributed by: Erisher Woyo (University of Namibia), Gladys Dadirai Rukanda (International University of Management, Namibia) and Zanele Nyamapanda (South Metropolitan TAFE College, Thornhill, Australia). Their purpose was to analyse the factors that affect perception of the implementation of ICT policy in education in the empirical context of higher education in Namibia from a students' perspective. The paper explains the current situation regarding ICT policy in higher education in Namibia. They found that perception of this is affected mostly by lack of ICT literacy and limited access to learning and training content. Some of the challenges from past studies were also reconfirmed in this study, though they were investigated in a different context. This study also identified new challenges that affect the perception of the implementation of ICT policy in higher education, specifically from a developing country context.

An extended model for assessing E-Services of Iranian Universities Websites Using Mixed MCDM method by Masoud Shayganmehr and Gholam Ali Montazer

(Tarbiat Modares University, Tehran, Iran) argues that since a university is considered one of the most pivotal hubs for developing science and knowledge it is expected to take e-services development seriously in comparison with other organisations and agencies. As websites are seen as the preliminary and fundamental infrastructure of e-services, regular assessment of websites is crucial for leveraging websites' quality. They note that different studies have been conducted for assessing e-services of university websites but that each has assessed limited dimensions of websites in a specific territory. They propose an extended model for assessing readiness of e-services of Iranian university websites which is able to evaluate wider dimensions by considering various and wider indexes and indicators in comparison with previous studies. A website for assessing readiness of e-services is a Multi Criteria Decision Making (MCDM) problem, Hybrid MCDM methods are proposed to determine the importance of indexes and indicators. The indexes and indicators are assigned weight and ranked by Analytical Hierarchy Process (AHP) and PROMETHEE methods respectively.

Tiina Leino Lindell (Royal Institute of Technology, Stockholm, Sweden) next offers: ***Exploring teachers' increased knowledge of the potential of mobile phone use: pilot study reducing the difference between students' and teachers' ideas.*** Students and teachers have dissimilar ideas about how mobile phones could be utilized and limited and this is a crucial problem that has caused conflicts in education. To resolve the problem research has stressed the importance of increasing teachers' knowledge about how mobile phones can be used in students' work, but how they could do this has remained largely unexamined. The reported pilot study explored how teachers' possibility knowledge is influenced when they are exposed to students' ideas about how mobile phones could be both supportive and problematic in school activities. Also, the similarities and differences between the students' ideas that have, and have not, influenced the teachers' possibility knowledge of mobile phone use. The results show how the teachers' possibility knowledge increases concerning the features that could be both supportive and problematic and must be limited by rules and a division of labour.

The Calculus for Kids project reported in the next article was deliberately designed to use computers in the transformation of curriculum. ***Transforming learning with computers: Calculus for kids*** comes from Andrew E. Fluck, Dev Ranmuthugala, C. K. H. Chin, Irene Penesis, Jacky Chong and Yang Yang (University of Tasmania, Launceston, Australia) and Asim Ghous (Australian Scientific & Engineering Solutions (ASES) Pty Ltd., Minto, Australia). The intervention described used multi-media learning materials to assist teachers and Year 6 students understand the principles of integral calculus. They used Maple mathematics software to solve real-world problems using these principles and by employing conventional mathematics notation on their individual computers. Positive gains were also found in students' attitudes, particularly in technology confidence. This article discusses methods for calculating the effect of transformational education with computers and recommends further research in the field.

Mehdi Niknam and Parimala Thulasiraman (University of Manitoba, Winnipeg, Canada) then offer: ***LPR: A bio-inspired intelligent learning path recommendation system based on meaningful learning theory.*** In this paper, one problem in adaptive learning systems called curriculum sequencing is addressed. A Learning Path Recommendation (LPR) system is designed and implemented that clusters the learners into groups and selects an appropriate learning path based on their prior knowledge. The clustering component uses Fuzzy C-Mean algorithms that can recommend more than

one learning path to learners located on the cluster boundaries. Using bioinspired Ant Colony Optimization (ACO) algorithm and meaningful learning theory, the ACO path finder component searches for a suitable learning path for the learners while incorporating their continuous improvements. The results of the experiment showed that the group using the LPR system had a significantly higher performance and knowledge improvement in the course than the control group.

Ayşe Çınar (Marmara University, Turkey), Elif Ince (Istanbul University-Cerrahpaşa, Turkey), Murat Gezer (Istanbul University, Turkey) and Özgür Yılmaz (Istanbul University-Cerrahpaşa, Turkey) next report on: ***Machine learning algorithm for grading open-ended physics questions in Turkish***. Worldwide, open-ended questions that require short answers have been used in many exams in fields of science, such as the International Student Assessment Program (PISA) and the International Science and Maths Trends Research (TIMSS), but multiple-choice questions are used for many exams at the national level in Turkey, especially high school and university entrance exams. This study aimed to develop an objective and useful automatic scoring model for open-ended questions using machine learning algorithms was conducted on four Physics questions at a University level course with the participation of undergraduate students. In this paper, they report on a short answer grading system in Turkish, based on a machine learning approach using a constructed dataset about a Physics course in Turkish.

Because of its affordability, mouse tracking serves as an alternative to eye tracking in measuring the learning process in education. The next article: ***Implementation of real-time online mouse tracking on overseas quiz session From server administrator point of view***, by Fajar Purnama (Kumamoto University, Japan), Otgontsetseg Sukhbaatar (Kumamoto University, Japan), Lodoiravsal Choimaa (National University of Mongolia) and Tsuyoshi Usagawa (Kumamoto University, Japan) addresses this. Mouse tracking does not require extra hardware, as in the case of eye tracking, because it is a feature in personal computers by default, making it possible to implement mouse tracking in a massive open scale. The implementation of mouse tracking in a non-laboratory environment is still rare as it is considered to be associated with high running costs, but this is disputed. The authors have developed an application to investigate real-time mouse tracking online, implemented on the Moodle learning management system and tested on an online quiz session accessed abroad.

Effects of microworld game-based approach on neuromuscular disabled students learning performance in elementary basic science courses is by Aditya Khamparia (Lovely Professional University, Punjab, India), Babita Pandey (Baba Saheb Bhimrao Ambedkar University, India) and Brijendra Pratap Mishra (Autonomous State Medical College, India). They point out that in conventional classroom-driven instructor training, disabled students lack motivation and have more mental load due to lack of practical learning and unsuitable usage of learning material. The intent was to integrate microworld game-based learning with the different learning styles of special needs students to enhance their learning performance and encourage them to discover and solve problems faced during classroom teaching. The experimental results showed that students who adopted the microworld gaming-based system were able to reduce their cognitive load, enhance learning motivation skills to gain understanding of novel concepts, improve interpersonal skills, and improve learning.

Exploring EFL pre-service teachers' adoption of technology in a CALL program: obstacles, motivators, and maintenance by Jalil Fathi (University of Kurdistan, Iran)

and Saman Ebadi (Razi University, Iran) begins by noting that despite the rise of computer-assisted language learning (CALL) as a field of inquiry, there are few empirical studies on the actual experience of English as a foreign language teachers (EFL) in the adoption of technology in their classes. Their study was designed to qualitatively examine six Iranian EFL pre-service teachers' experiences in implementing CALL activities. The pre-service teachers first took the CALL-integrated teacher training course for a period of four weeks and upon completion they subsequently implemented CALL in their own classes for seven weeks. The thematic data analyses revealed obstacles, motivators, and maintenance, each with its own sub-themes. Obstacles to CALL implementation included transfer failure and facility conditions, while the motivators were perceived usefulness and experience.

Soukaina Ennouamani, Zouhir Mahani and Laila Akharraz (Ibn Zohr University, Morocco) next offer: ***A context-aware mobile learning system for adapting learning content and format of presentation: design, validation and evaluation***. Technological progress in the usage of mobile technologies and devices as well as the ubiquitous wireless communication can be used to facilitate the students' lives by creating smart and personalised solutions considering their personal and academic profiles as well as their real environments. Mobile technologies have the capacity to detect the contextual dimensions of learners through different sensors and the available software has shown a big improvement in recent years. This article proposes a model called Dynamic Mobile Adaptive Learning Content and Format (D-MALCOF) that considers the learner's knowledge level and learning styles in order to provide suitable learning for each and every student.

Digital devices have become widespread in recent years and children's interest in them has significantly changed their own learning habits and interaction in infancy and early childhood. This posits both benefits and risks in gaining informal learning experiences remark Nadezhda V. Sivrikova, Tatyana G. Ptashko, Artem E. Perebeynos, Elena G. Chernikova, Natalya V. Gilyazeva and Victoria S. Vasilyeva (South Ural State Humanitarian Pedagogical University, Chelyabinsk, Russia) in their article: ***Parental reports on digital devices use in infancy and early childhood***. In their research, parents of 113 children participated in an online survey to find out peculiarities of the children using digital devices for learning, frequency of using them, and parents' mediation in this process. The findings showed that the number of children using digital devices for learning increased with age. Devices with the touch screen were especially popular for viewing videos, self-development, and gaming.

Students' interaction patterns in different online learning activities and their relationship with motivation, self-regulated learning strategy and learning performance describes research by Ayça Çebi (Trabzon University, Turkey) and Tolga Güyer (Gazi University, Turkey). Learning materials used in the research including different kinds of activities prepared and presented for use by university students. It was found that students spent a longer time in tutorial and video activities and visit these more frequently. The results of this study show that self-regulated learning strategies differ from its sub-dimensions in terms of rehearsal, organization, elaboration, metacognitive self-regulation, time and study environment.

Predicting school performance and early risk of failure from an intelligent tutoring system. In the next article, Mithun Haridas (Amrita Vishwa Vidyapeetham, Amritapuri, India), Georg Gutjahr (Amrita Vishwa Vidyapeetham, Amritapuri, India),

Raghu Raman (Amrita Vishwa Vidyapeetham, Coimbatore, India), Rudraraju Ramaraju (University of Alabama, USA) and Prema Nedungadi (Amrita Vishwa Vidyapeetham, Amritapuri, India) point out that in many rural Indian schools, English is a second language for teachers and students and that intelligent tutoring systems have good potential because they enable students to learn at their own pace in an exploratory manner. This paper describes a 3-year longitudinal study of Indian students who used the intelligent tutoring system, AmritaITS with the aim of predicting student performance, in English and Mathematics subjects, predicting students who may be at risk of failing the final examination and to screen students who may have reading difficulties.

Emanuele Bardone (University of Tartu, Estonia), Tony Tonni (Tartu Heino Eller Music College, Estonia) and Irene-Angelica Chounta (University of Tartu, Estonia) then write: ***The educational technologist as a variety-handler Videoconferencing for remote music lessons as a case in point*** in which they theorise the role of the educational technologist in an educational institution as a “variety-handler”, responsible for the orchestration of educational and technical resources and tools, either to attenuate systemic variety or amplify regulative variety at a certain level of recursion. To do this they carried out a single case study that focused on the work of the educational technologist in a Music College who provided support to an accordion teacher and his student in remote music lessons. Their case study indicates that, depending on the context, the educational technologist may take many roles, including designer, technician, researcher and planner.

Emerging technologies and mobile devices have enabled improved quality of learning outcomes in the field of language learning say Ehsan Namaziandost (Islamic Azad University, Iran) and Fidel Çakmak (Alanya Alaaddin Keykubat University, Turkey) in their article: ***An account of EFL learners’ self-efficacy and gender in the Flipped Classroom Model***. The flipped classroom is one of the innovative learning models that have appeared in language learning in the last decade and their study was carried out to investigate the difference that the flipped classroom made on students’ self-efficacy according to gender. Participants with an intermediate proficiency level in English were randomly assigned to one of two conditions: experimental (flipped classroom) and control (traditional) group. The results demonstrated a significant increase in self-efficacy scores of the experimental group, but when gender was analysed separately, the females in the experimental group were found to have greater improvements in self-efficacy than their male colleagues

Adoption of mobile applications for teaching-learning process in rural girls’ schools in India: an empirical study from Sheshadri Chatterjee (Indian Institute of Technology Kharagpur), Dipasree Majumdar (Barlow Girls’ Institute, North Bengal University, India), Sanjay Misra (Covenant University, Nigeria and Atilim University, Turkey) and Robertas Damaševičius (Silesian University of Technology, Poland) follows. The purpose of this study was to identify the factors that can impact the adoption of mobile apps for teaching-learning processes focusing on a girls’ school in rural India. Hypotheses were proposed, a conceptual model developed and a survey to collect the data from different respondents. Their results showed that among other issues, price value has a insignificant influence on the intention of these girl students.

James Sunney Quacoe and Kai Pata (Tallinn University, Estonia) then present a survey-based study exploring the nature of the Digital Divide among Ghana’s basic (primary and junior high) schools from the perspective of Teachers’ Digital Literacy

and their usage of digital technologies in school, in their article: ***Teachers' digital literacy and digital activity as digital divide components among basic schools in Ghana***. They point out that the ICT-enhanced Teacher Standards for Africa (ICTeTSA) Framework comprising digital attitude, knowledge, skills and application components was used for measuring the perceived Teacher Digital Literacy, while, the European Union's rubrics for measuring ICT frequency in schools was adopted for estimating the extent of teachers' digital technology usage/activities. Their study covered six districts in Ghana with teachers sampled from 45 schools. The study reveals several critical issues of teachers' digital empowerment for technology in Ghana's basic schools, and which school-based management governance should be adapted to address them.

Emre Çoban, Özgen Korkmaz, Recep Çakır and Feray Uğur Erdoğan (Amasya University, Turkey) write on a study to determine the attitudes of pre-service teachers towards programming, the perceptions of self-efficacy about block-based programming and the opinions of pre-service teachers on the use of educational robots. Their article: ***Attitudes of IT teacher candidates towards computer programming and their self-efficacy and opinions regarding to block-based programming*** involved undergraduate students from the universities in Turkey who were studying in the Department of Computer Education and Instructional Technologies. Pre-service teachers' opinions about educational robots are that they contribute to problem solving and programming skills.

Participatory design of persuasive technology in a blended learning course: A qualitative study comes from: Monique M. J. Engelbertink (Saxion University of Applied Sciences and University of Twente, the Netherlands), Saskia M. Kelders (University of Twente, the Netherlands and North West University, Vanderbijlpark, South Africa), Kariene M. Woudt-Mittendorff (Saxion University of Applied Sciences, the Netherlands) and Gerben J. Westerhof (University of Twente the Netherlands). They argue that whereas blended learning can deliver several benefits to students in higher education, their achievement depends on how exactly it is designed, and a participatory design is recommendable to try to meet the needs of all stakeholders. The Persuasive System Design-model can be used to motivate students during the online part of the course. They found that the participatory design approach may lead to an engaging blended learning course that encourages the use of persuasive technology with an optimal focus on content, target group, context and ethical aspects of the blended course.

Mobile phone use is increasingly widespread among university students and different factors can affect students' behaviour towards the use and acceptance of mobile technology. Kleopatra Nikolopoulou and Vasilis Gialamas (National and Kapodistrian University of Athens, Greece) and Konstantinos Lavidas (University of Patras, Greece) make use of the Unified Theory of Acceptance and Use of Technology (UTAUT) to investigate this. ***Acceptance of mobile phone by university students for their studies: an investigation applying UTAUT2 model*** aimed to evaluate the behavioural Intention of university students for acceptance and use of a mobile phone in their studies. They found that the most important predictors for students' behavioural intention to use mobile phones in their studies were habit, performance expectancy and hedonic motivation.

Francisco D. Guillén-Gámez (University of Almería (UAL), Spain) and M^a José Mayorga-Fernández (University of Malaga (UMA), Spain) next describe their research into: ***Quantitative-comparative research on digital competence in students, graduates and professors of faculty education: an analysis with ANOVA***. They note that the figure of the teacher is a key element to train students in the use of new information and

communication technologies which will positively influence the entire teaching-learning process and so it is an indispensable requirement that they develop digital teaching competence, understanding this construct as the set of knowledge, use and attitudes towards digital technologies. Their results showed significant differences in attitudes towards digital technologies among students and graduates with respect to the university teaching staff.

Google classroom: insights from Malaysian higher education students' and instructors' experiences describes research by: Jeya Amantha Kumar (Universiti Sains Malaysia), Brandford Bervell (University of Cape Coast, Ghana) and Sharifah Osman (Universiti Teknologi Malaysia). Google Classroom (GC) has provided affordances for blended learning in higher education and so many Malaysian higher educational institutions are adopting this learning management system technology for supporting out of classroom learning. Their study employed a qualitative approach with data collected from seventeen students and three instructors from a Malaysian higher education institution. It revealed usefulness and easiness were the main factors influencing the use of GC, but concerns were raised by students based on privacy issues, peer interaction, and interface design and instructors.

Longitudinal study of Kyrgyz students' general physics course performance in paper-based versus online-based tests was presented by: Gülgün Afacan Adanır (Ankara University, Turkey), Azat Akmatbekova and Gulshat Muhametjanova (Kyrgyz-Turkish Manas University, Kyrgyz Republic). This study was conducted to examine students' performance in paper-based and online-based tests in the General Physics course by students of Engineering and Science faculties at a public university of Kyrgyz Republic. The results showed that students' demographic data (i.e. gender, faculty and major) had different effects on their performance, students performing better in online-based tests compared to paper-based tests. The majority of the instructors indicated that they experienced difficulties related to the traditional form of evaluation due to lack of time to give personal feedback to each student, lack of time for objective evaluation and difficulty of evaluation of crowded student groups.

The next article describes a study aimed at identifying the potentials of and barriers to the Smart School Project (SSP) in Iran. ***Smart school project in Iran: Potentials and barriers*** was contributed by Farhad Seraji (Bu-Ali Sina University, Iran), Hamed Abbasi Kasani (Shahid Beheshti University, Iran), Hojjat Abedi (Shahid Beheshti University, Iran) and Mohammad Sajedifard (Allameh Tabatabai University Iran). Surveys and interviews with school teachers, principals, and information technology experts found both potentials and barriers. The potentials included: improving teachers', principals', and students' knowledge, skills and attitudes toward using information and communication technology, access to quality e-content, increasing school facilities, potentials available in the social environment, developing curriculum beyond schools, student participation in the learning process, enhancing school and parent relationship, and social supports and enacted laws. Barriers included: teachers', principals' and students' lack of access to ICT and using it, vagueness in policies, missions, and goals of ICT integration into school curriculum, lack of support system and supervision, lack of specialized training for principals and teachers, barriers concerned with the nature of ICT, incompatibility of curriculum structure with ICT, structural and organizational barriers, cultural conditions and barriers, and lack of space and equipment.

Toward the visual understanding of computing curricula by: Shingo Takada (Keio University, Yokohama, Japan), Ernesto Cuadros-Vargas (Universidad de Ingeniería y Tecnología, Lima, Peru), John Impagliazzo (Emeritus, Hofstra University, USA), Steven Gordon (Emeritus, Ohio State University, USA), Linda Marshall (University of Pretoria, South Africa), Heikki Topi (Bentley University, USA), Gerrit van der Veer (Vrije Universiteit Amsterdam, Netherlands) and Leslie Waguespack (Bentley University, USA) follows. Various computing sub-disciplines, such as computer science and software engineering, each have their own curricular guidelines and these can be very difficult to understand and compare for people such as prospective students, industry personnel, and even faculty members. This is compounded by a lack of information surrounding undergraduate computing curricular topics via visual methods, and this paper describes two experimental activities where the objective is to explore the possibility of obtaining quantitative data sets necessary for visualization, one based on competencies and the other based on knowledge areas. The results from the first activity showed that a consensus interpretation could be obtained for the knowledge, skills, and dispositions implied by the competency descriptions, although not as strongly for dispositions. The second activity resulted in a table of knowledge areas with minimum and maximum weights for six computing sub-disciplines.

The next study investigated the effect of mixed reality applications on students' motivation to learn science, comes from: Dogus Beyoglu and Cigdem Hursen (Near East University, Nicosia, Cyprus) and Arda Nasiboglu (Lapta Primary School, Kyrenia, Cyprus) and is titled: ***Use of mixed reality applications in teaching of science***. It aimed to identify primary students' attitudes toward augmented reality applications and to explore the students' views on mixed reality applications. The results of the study indicated that mixed reality applications are effective in students' motivation for collaborative work in science teaching and that students were willing to use the augmented reality applications in science teaching and their anxiety levels decreased.

Erik Kormos (Ashland University, USA) and Liliana Julio (Universidad Simon Bolivar, Colombia) then offer: ***Student attitudes toward instructor assessment in higher education: Does the delivery method matter?*** This study investigated community college students enrolled in face-to-face and online speech communication courses and their perceptions of instructor speech assessments. Students enrolled in a face-to-face public speaking course reported statistically significant higher levels of satisfaction with instructor assessment as opposed to those enrolled online. The results also suggest that students in a traditional environment believed instructor assessment plays a role in increased credibility related to public speaking.

Effects of pedagogy and information technology utilization on innovation creation by SECI model is from: Noawanit Songkram and Suparoek Chootongchai (Chulalongkorn University, Bangkok, Thailand) who point out that in today's society, innovation and creativity are needed in many areas, but unfortunately graduated students miss out on employment opportunities due to a lack of creativity. Based on a literature review, classroom observation and administrators' feedback, there are three areas to support student creativity: Learner Engagement, Physical Environment and Learning Environment. They argue that Nonaka's SECI (Socialization, Externalization, Combination and Internalization) model developed from knowledge creation is the key source of creating innovation and the best-known conceptual framework for understanding knowledge generation processes to produce innovation. They found that

brainstorming techniques, inquiry method, collaborative learning method, project-based learning method, information technology utilization, and knowledge sharing among the undergraduate students were rated at the high level.

Hatim Ibrahim (Imam Abdurrahman Bin Faisal University, Saudi Arabia) next presents: *Effectiveness of the use of the E-Gamification strategy to develop the educational achievement of the preparatory students in Dammam City and their attitudes towards it*. The goal of this research was to identify the effectiveness of using the strategy of electronic defects in the development of the educational techniques of middle level students in Dammam city (Saudi Arabia). An experimental and a control group were set up and the research found statistically significant differences, between average student grades of the experimental group and the control group.

The article that follows, *Decision support model to help language teachers grouping adult learners in a classroom* comes from Moh R. Dahman (DAHMAN'S Phi Services, Fulya Mah Aytekin Kotil Cad Yildizay) and Semiha Dahman (Istanbul University, Turkey). They note that language Teachers' tasks are overwhelmingly complex, particularly in motivating their learners. A vast sea of literature has suggested different motivational strategies, one, in particular, is a group-work strategy. In the reported study the researchers offered a decision support model (DSM) – a type of unsupervised one, to group adult learners in a classroom based on four narratives: personal, analytic, introspective, and interactive and their attributes. English intermediate level learners and teachers from Istanbul participated in the study. The experimental treatment involved integration of a DSM system in the classroom over a 12-week period, while a control group received a traditional grouping method based on the teachers' decision. They found that in the experimental group, motivation, attitude and language performance had significantly increased, and language anxiety decreased by the learners as well as motivational level of their teachers.

Sedat Turan and Fatih Aydoğdu (Erzincan Binali Yıldırım University, Turkey) then write on: *Effect of coding and robotic education on pre-school children's skills of scientific process*. The study groups consisted of children aged five who studied in an independent kindergarten. Half were in the experiment group of a "Coding and Robotic Education Program" and the others in the control group. "Scale for Preschool Students' Basic Skills" developed by Aydogdu and Karakus was applied to both experiment and control group before and after the education. As a result of the study it was found that the post-test scores of the children in the experiment group were significantly higher than their pre-test scores while there were no significant differences in the control group. It can thus be claimed that the robotic coding education, applied to preschool children, developed the children's skills of scientific process.

Cognitive optimism of distinctive initiatives to foster self-directed and self-regulated learning skills: A comparative analysis of conventional and blended-learning in undergraduate studies comes from: Daniel F. O. Onah (Lancaster University, UK), Elaine L. L. Pang (University of Nottingham Malaysia) and Jane E. Sinclair (University of Warwick, UK). Independent learning in massive open online courses (MOOCs) requires considerable effort from the learners themselves and blended-learning has been recognised to foster independent learning among undergraduate students. With the popularity of the blended-learning approach to teach in traditional educational settings, they argue, little has been mentioned on how cohesive this approach is in fostering self-directed learning and self-regulation among university

students. Their study explored students' self-directed and self-regulated learning skills in conventional classrooms and aspects of blended-learning embedded in a MOOC platform in two academic years for undergraduates at a top UK university, with students from two departments: Science and Social Science.

Development of the smartphone and learning inventory: Measuring self-regulated use. Kendall Hartley, Lisa D. Bendixen, Lori Olafson, Dan Gianoutsos and Emily Shreve (University of Nevada, Las Vegas, USA) point out that smartphone use in learning environments can be productive or distracting depending upon the type of use and is impacted by the learner's view and understanding of the smartphone and self-regulated learning skills. Measures are needed to specify uses and learner understandings to address the implications for teaching and learning and the study reports on the development of a multi-factor inventory designed to measure multitasking while studying, avoiding distractions while studying, mindful phone use, and phone knowledge.

The next study explores best practices and roles of ICT in select university professional development centres. ***Optimal professional development ICT training initiatives at flagship universities*** was contributed by: Xi Wang (University of Pittsburgh, USA), W. James Jacob (Collaborative Brain Trust, Salt Lake City, USA), Christopher C. Blakesley (Carnegie Mellon University, USA), Weiyan Xiong (Lingnan University, Hong Kong), Huiyuan Ye (Southern New Hampshire University, USA), Shangmou Xu (University of Pittsburgh, USA) and Fang Lu (South China University of Technology, People's Republic of China). It explores the strengths and weaknesses of current technology training initiatives in the selected professional development centres where leaders shared current ICT practices as well as strengths and limitations of their own centres. The paper concludes with suggestions on how professional development centre leaders, senior administrators, and educational policy makers can help improve professional development processes with the assistance of optimal ICT initiatives.

Relationship between motivations, personality traits and intention to continue using MOOCs. In the next article, Hend Abdullatif and J. Ángel Velázquez-Iturbide (Universidad Rey Juan Carlos, Spain) note that although MOOCs represent an emerging model for delivering education services they suffer significant dropout rates, which have been attributed to the low motivation of the registered students. This research seeks to understand the variance in the levels of intention to continue using MOOCs in relation to internal and external motivation and personality traits: agreeableness, extraversion, and conscientiousness. The main implication of this research is that to use MOOCs in the future, different personalities need different motivations in their first use of them.

The next study investigated under-graduate students in Romania and Spain to examine potential differences in perception and acceptance towards using web-based technologies. Nuri Balta (Suleyman Demirel University, Kazakhstan), Liliana Măță (Vasile Alecsandri University of Bacău, Romania), Carlos Hervás Gómez (University of Seville, Spain) and Katerina Tzafilkou (University of Macedonia, Greece) write on: ***Students' perception and acceptance of web-based technologies: a multi-group PLS analysis in Romania and Spain.*** Their research model was based on the Internet Attitude Scale and measures Perceived Enjoyment, Perceived Anxiety, Perceived Usefulness and Computer Self-Efficacy. Results from country-based group comparisons reveal significant differences in all four constructs, while gender does not seem to affect any of them.

Michelle M. Neumann (Griffith University, Australia) and Christothea Herodotou (Open University, Milton Keynes, England) next report on: ***Evaluating YouTube videos for young children***. They note that YouTube has become a popular digital media platform used by young children, but that concerns have been raised around inappropriate video content and limited quality. In their study they review research and develop a set of design principles that informed the production of a YouTube video rubric used to evaluate the quality of YouTube videos targeted at young children. Four key criteria were used to evaluate each video: Age appropriateness, Content quality, Design features and Learning objectives.

Design framework of adaptive intelligent tutoring systems by Ali Kürşat Erümit (Trabzon University, Turkey) and İsmail Çetin (Ondokuz Mayıs University, Turkey) examines adaptation elements and Intelligent Tutoring System elements used in Adaptive Intelligent Tutoring Systems. They used meta-synthesis methods to analyse results of previous research of articles appearing in the Web of Science, Google Scholar, Eric and Science Direct databases. Their results confirmed that the systems were designed for a wide range of fields such as Information Technologies, Mathematics, Science, Medicine, and Foreign Language Education. Content adaptation was generally used, based mostly on such criteria as feedback, student level, student learning and cognitive styles, and student performance.

To: -) or to ☺, that is the question: a study of students' initial impressions of instructors' paralinguistic cues describes research by Kyle R. Vareberg and David Westernman (North Dakota State University, USA). Their paper explores the use of paralinguistics, defined as cues which facilitate interaction and communication without the use of specific words (e.g. emoticons, emojis) in instructor-student technologically-mediated out-of-class communication. Using an experiment manipulating cue use and instructor gender in initial emails they examined how respondents' impressions of instructors' credibility and immediacy are influenced by these paralinguistics. Results suggest instructors who use paralinguistics may be perceived as more immediate and caring but less competent; perceived trustworthiness was unaffected by paralinguistic use. Instructor gender did not generate significant differences in students' impressions.

Salih Toscu (English Preparatory School, Çankaya University, Turkey) and İsmail Hakkı Erten (Hacettepe University, Turkey) next write on: ***Developing intercultural communicative competence by the means of telecollaboration***. Their paper presents the results of an eight-week quasi-experimental study of English as a foreign language (EFL) learners at the tertiary level in Turkey, the purpose of which was to reveal the extent to which EFL learners' intercultural communicative competence was enhanced as a result of communication with native and non-native speakers of English with the means of a/synchronous communication tools as compared with the instruction given in a real classroom setting. The findings evidenced that telecollaboration had a positive impact on the participants' intercultural communicative competence.

The next paper describes a study to develop and validate the MOOC Success Scale (MOOC-SS) in the Malaysian context and comes from Nour Awni Albelbisi (University of Malaya, Malaysia). ***Development and validation of the MOOC success scale (MOOC-SS)***. Based on a literature study, six factors related to MOOC success were derived: system quality, information quality, service quality, attitude, course quality, and satisfaction. And data were collected from undergraduate students from public universities in Malaysia. Results of the principal component analysis empirically confirmed that the MOOC success

scale with six factors and 33 items is strong enough to recommend its use in MOOC settings. Also, the finding of predictive validity indicated that system quality, attitude, and course quality appeared to predict satisfaction toward MOOC.

Parents' beliefs about and associations to their elementary children's home technology usage was contributed by: Taylor Downes, Dane Marco Di Cesare and Tiffany L. Gallagher (Brock University, Canada) and Jennifer Rowsell (University of Bristol, UK). The reported study sought to gather information through a survey of how newcomer parents' beliefs about technology usage and how they engage with technology as they support their children with twenty-first century literacies. Parent respondents were drawn from two publicly funded schools in the Niagara Region, Ontario, Canada, where 14% of the population between the ages of 25 and 64 has not completed their high school education; over 27% of families with children are single-parent and over 10% of the population has immigrated to the region. Descriptive statistics quantified daily technology activities as being communication-oriented with the majority of parents holding distinct beliefs about the amount and type of their children's technology usage. Chi-square tests indicated significant associations for demographic characteristics such as the gender, age, education, first language, and ethnicity of the parents as determinants of their beliefs about their children's technology usage (e.g., social media, mobile phones, television).

Regardless of the knowledge area they teach, research skills are part of the academic activities of Higher Education teachers with a need to observe, reflect, select, analyse and communicate scientific results using technological advances. **ICT resources for research: an ANOVA analysis on the digital research skills of higher education teachers comparing the areas of knowledge within each gender** comes from: Francisco D. Guillén-Gámez (University of Almería, Spain), Julio Ruiz-Palmero, Enrique Sánchez-Rivas and Ernesto Colomo-Magaña (University of Malaga, Spain). The aim of their research was to analyse the use teachers make of different ICT resources for research in terms of gender, comparing within each gender different areas of knowledge to which teachers belong (Science and Engineering-Architecture, Health Sciences, Art-Humanities and Social-Legal Sciences). The results highlighted that the Engineering-Architecture area is the one that makes the greatest use of ICT for research in comparison with the Art-Humanities area which uses ICT resources the least.

The following paper is by Narjis Sherafati (University of Mazandaran, Iran), Farzad Mahmoudi Largani (Islamic Azad University, Iran) and Shahrzad Amini (University of Tehran, Iran): **Exploring the effect of computer-mediated teacher feedback on the writing achievement of Iranian EFL learners: Does motivation count?** They note that use of a computer as a means or source of feedback provision has facilitated the process of teaching and learning writing and integration of computers into writing classes has enabled teachers to provide timely and reliable feedback. This study investigated the efficacy of using computer-mediated teacher feedback and computer-generated feedback on learners' writing skill. Learners' motivational level was also explored. Intermediate EFL learners were selected from two intact classes and were randomly assigned to treatment groups. The study concluded that computers are a good medium for feedback provision but that learners do not appreciate the role of computers as the source; rather, they accept it as a supplement to teacher feedback.

Exploring factors affecting academics' adoption of emerging mobile technologies-an extended UTAUT perspective by Sailong Hu (Royal New Zealand Police College),

Kumar Laxman and Kerry Lee (University of Auckland, New Zealand points out that with proliferation of technology and the Internet, the way education is delivered has undergone a rapid change in different educational settings. Their study investigated the acceptance, preparedness and adoption of mobile technologies by academic faculties within higher education, using the context of China. Underpinned by the extended Unified Theory of Acceptance and Use of Technology (UTAUT2) Model, a large-scale quantitative survey investigated the factors affecting academics' behavioural intentions and use for mobile technologies, and variations between different demographic groups. Findings suggested that the most significant factors affecting academics' behavioural intention and behaviours of use were their performance expectancy, facilitating conditions, hedonic motivation and habit. Behavioural intention also affected how the faculty staff used their mobile technologies and gender, age, teaching experience and discipline were found to be moderating factors.

The final article in this issue: *Impact of the learning set's size* comes from Adil Korchi (University Sidi Mohamed Ben Abdellah, Morocco), Mohamed Dardor (Dhar El Mehrez, Morocco) and El Houssine Mabrouk (Moulay Ismail University, Morocco) in which they indicate that learning techniques have proven their capacity to treat large amount of data but that most statistical learning approaches use specific size learning sets and create static models. A search for algorithms capable of producing models that can work with only small amounts of data are useful in some cases such as incremental or active learning. Their paper seeks to study a wider range of learning algorithms as well as data sets in order to show the power of every chosen algorithm that manipulates data and to show that there are algorithms able of generating models with little data. They study behaviour of these algorithms as a function of learning set's size through an experimental protocol in which various datasets are split, manipulated and evaluated from the classification field in order to give results that merge from their experimental protocol.

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