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International Journal of Technology Enhanced Learning
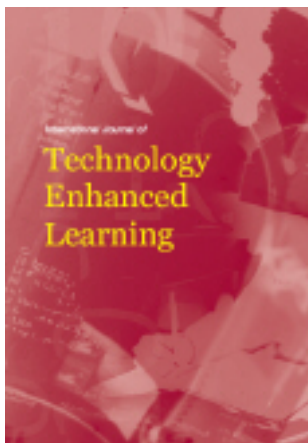
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International Journal of Technology Enhanced Learning (24 papers in press)

Regular Issues

- **Brain-compatible courseware impact on learning computer programming**
  by Elaheh Badiee, Mohammad Reza Nili, Yasamin Abedini
  Abstract: The purpose of this study is to investigate the effect of brain-compatible courseware on students learning achievement and retention in computer programming course. In this quasi-experimental study, 60 eleventh grade female students in computer vocational schools were randomly assigned to two experimental groups and one control group of 20 each. The control group was taught in the conventional method. The first experimental group used the researcher-made brain-compatible courseware and the second

experimental group used the non-brain-compatible courseware. A researcher-made programming test was conducted as the pre-test, post-test, and retention test. The results of the ANCOVA test indicate that using the brain-compatible courseware significantly improves the students learning achievement and retention compared to the second experimental and control group students ($P<0.05$). It is inferred that the use of brain-compatible courseware is more effective than the use of non-brain-compatible courseware and the conventional method.

Keywords: *brain-based learning; courseware; learning; retention; computer programming; visual basic.*

- **Reforms and Applications of Online Practice Teaching in the field of New Engineering**

by Lida Zhu

Abstract: Practice teaching is an effective way for students to consolidate their theoretical knowledge and is also a significant module of talent training models used in higher education. Recently, offline practice teaching has faced limitations of space and time, which, online practice teaching, as a supplement to the offline teaching, is an innovative exploration of traditional practice teaching ideas. Such ideas are actively promoted through the extensive integration of information technology and education and a scientific approach using related research results as feedback to create new teaching resources. This simulation platform facilitates the quality and efficiency of the training operations and delineates its applications on machines and engineering equipment. Moreover, students in-depth knowledge gained through this platform further enhances their ability to practice using innovative ideas. Overall, the study aims to contribute to broadening the horizons for and enhancing the quality of online practice teaching.

Keywords: *New Engineering; Mechanical Engineering; Online Practice teaching; Teaching Reform.*

- **Students experience of peer-interaction in a blended learning course at a South African Higher Education Institution**

by Kimera Moodley, Mari Van Wyk, Eugenie Wolff, Ankie Robberts

Abstract: An investigation of students experiences of peer-interaction in a blended learning eLearning course was conducted. In order to understand, evaluate and improve student experience of peer

interactions, four learning facilitators revised the course, to align with current instructional design best practices which included a fair amount of peer interaction. In this qualitative study, the activities were designed using a constructionist approach and structured to increase student engagement with content and peers including frequent collaborative group-work activities. For most students, this was the first time that they were exposed to a blended classroom which required students to make use of teaching and learning technology tools to investigate eLearning content, and design and develop 4 artefacts online while presenting findings and assessing the products and performance of their peers in contact sessions. The findings mitigate the importance of course design, peer assessment, and group work activities that impact student experiences of peer interaction.

- **ICT complement for supporting flute study at home**

by Paloma Bravo, Iván González, Jose Bravo

Abstract: Many countries propose flute studies in primary school. Usually, students have only one class per week, which makes it inconvenient for teachers to pay attention to students individually. Another problem is that, after lessons, students have to practice alone at home. Thus, the responsibility for progress lies almost entirely with the learner. This paper proposes a digital tool as a complement to alleviate both problems. The app provides a listening tool, music scores view, records learner performances and offers feedback about students mistakes during their performances. Finally, the student evolution is sent to the teacher in an adequate manner, to achieve more effective teaching in each class.

- **Impact and success factors of online education methods at university level in times of Covid-19**

by Anahi Ibanez, Augustinus Van Der Krogt, Michael Neubert

Abstract: The drastic changes that Covid-19 has brought along includes the necessity to introduce new forms of online university education. This article compares the impact of the change from face-

to-face to on-line classes on student performance and satisfaction and identifies key success factors for effective on-line teaching. The study is based on the comparison of 34 face-to-face and online courses in 2019 and 2020 among 416 students of the 1e to 4e year from the degree programs of the Faculty of Business Sciences of the German Paraguayan University in Paraguay. The study provides a methodology to identify and measure the success factors for an effective change to online education and provides practical lessons learned on the effective integration of digital tools in the teaching and learning process, relevant for other universities in developing and developed countries alike.

Keywords: *online education; synchronous and asynchronous teaching; teaching and learning processes; pedagogical training; digital training; competence-based learning;.*

- **Prosodic characterization of children's Filipino read speech for oral reading fluency assessment** 📧

by Francis Dimzon, Ronald Pascual

Abstract: This paper explores the extraction and analysis of prosodic features in children's Filipino speech for application in automated oral reading fluency assessment. Automatic syllabication was optimized in the context of children's Filipino read speech. Using the Children Filipino Speech Corpus, prosodic features were automatically extracted which were then classified according to human rater assessment of fluency. Analysis of variance showed that speech and articulation rates, pauses, syllable duration, and pitch can be used to classify children's oral reading fluency in Filipino into three levels, namely, independent, instructional, and frustration. Using machine learning classification methods, 5-fold cross validation showed that speech rate, articulation rate, and number of pauses can be used to predict oral reading fluency at 92%, 85%, and 76% accuracy for 2, 3, and 4 levels of fluency classification, respectively. Pitch and syllable duration patterns were also characterized for the assessment of phrasing and expression between fluent and non-fluent readers.

Keywords: *Oral reading fluency assessment; prosody; Filipino language; children's read speech.*

- **Analysis of e-content of Khuzestan Province teachers during the COVID-19 period based on Mayer's principles** 📧

by Majid Hamdani

Abstract: The current study investigates the e-content prepared by teachers during the Co-rona period in terms of observing the principles of e-content design. Meyer theo-ry with 12 principles has been used for design principles. To this end, a checklist with 12 components with face validity and reliability of 0.78 from Cronbach's al-pha test, and 275 educational videos produced by teachers in Khuzestan province based on available sampling method and based on 12 components of Mayer theo-ry were reviewed by three educational technologist. The results revealed that the contents prepared in only three components spatial contiguity, segmentation and multimedia at the level of 1% were significantly above average and the rest of the components were all significantly below average that include 8 compo-nents. The pre-training component was not significantly different from the mean. Generally, the results indicated that the e-content design principles were not significantly observed in the prepared e-content at the level of 1%.

- **ONLINE ENTREPRENEURSHIP LEARNING: A CASE STUDY OF A TECHNICAL PUBLIC UNIVERSITY**

by Amiruddin Ahamat

Abstract: An online learning platform is a network of interconnected interactive online services that provide lecturers, students, and people interested in education with the knowledge, tools, and resources necessary to support and improve the process and management of education. The purpose of this research is to examine the challenges that arise during an entrepreneurship course delivered via online learning platforms. The methodology used in this study employs qualitative methodologies to ascertain students' intentions to become entrepreneurs. Interviews were conducted to elicit information about the materials used in the entrepreneurship course delivered via online learning platforms, as well as the obstacles and limits associated with online learning in this context. According to the study, all three components have an effect on the online learning process. The three components include instructional materials, difficulties, and limits

associated with online learning systems.

- **Investigating a MOOC educational model and the attitude of university students towards digital education**

  by Szabolcs Prónay, Zoltán Majó-Petri, László Dinya, Sándor Huszár

  Abstract: COVID-19 pandemic was a global crisis in one hand but at the same time it positioned distance learning in the forefront of the education worldwide. Digital educational and MOOC methodologies were suddenly utilized in wide spectrum but with mixed results. In our paper we show that MOOC type of education can be an operational model for mass personalization in higher education. Building on technology acceptance models (TAM), we demonstrate the results of an empirical exploration research proving that such an autonomous - kind of "campusless" - digital educational solution can be acceptable to higher education students. We conclude that MOOC education has proved to be viable/relevant based on the experience of our analyzed population, but only if it efficiently supports learning and is suitable to promote autonomous learning. It also means that a simple solution does not necessarily result in a positive attitude among students.

- **Bite-sized and Peer-assisted Video-based Learning in Statistics Education: Benefits on Attainment, Attitudes and Preferences of University Students**

  by Angel Tan, Linda Kaye, Elena Spiridon, Jean Davies, Roderick Nicolson, Themis Karaminis

  Abstract: The use and acceptance of online learning have increased following the COVID-19 pandemic. This mixed-methods study examined learners preferences and performance in online learning interactions in relation to two factors: 'bite-sized' learning and 'presenter status' in instructional videos. University students (N = 18) without a mathematical background utilised bite-sized online learning episodes focusing on statistics. Each episode included a 10-minute instructional video followed by an assessment. The videos implemented three alternative 'presenter-status' conditions: lecturer, student-imitating-lecturer, or student-peer-tutor. Individual students completed three episodes, one from each presenter-status condition

(counterbalanced). Participants presented high performance in the post-episode assessments, irrespective of presenter status. Students also reported remarkably positive views towards bite-sized learning in user-satisfaction questionnaires. Finally, qualitative analysis of open-ended responses and interviews uncovered three main themes: positive learning experiences, divergent attitudes towards video-based learning, and differential preferences for presenter status. These findings have clear implications for teaching and learning in Higher Education

Keywords: *Online learning; Video-based learning; Bite-sized learning; Technology-enhanced learning; Statistics literacy; Higher Education; Mixed methods.*

- **Fuzzy Logic Controller Development for Prediction of Student Performance Based on Activity Parameters**

by *Jugoslav Achkoski, Aner Behlic, Kristijan Ilievski, Nevena Serafimova, Gjorgji Alceski*

Abstract: Due to the COVID-19 pandemic, most of the academic education has suddenly shifted from traditional teaching methods to advanced technological methods on the Internet. Many teachers encountered difficulties in successfully evaluating and monitoring their students. We address these challenges and propose a fuzzy logic based controller that can assists teachers during classes and support allocation of appropriate resources to students. The purpose of the controller is to provide early warning about students who have performed poorly in the initial part of the course assessment. The controller makes predictions based on 5 input parameters which, by applying statistical tools, have been proven to accurately reflect the students achievements. The model was tested on a group of 50 students and the results indicate 82% prediction accuracy. There is a possibility for additional improvements related to the built-in parameters, both in terms of their selection and in terms of their number.

Keywords: *fuzzy logic controller; student assessment; online learning platforms; learning performance; linear regression.*

- **Emotional Intelligence development: the implementation of Transformative Learning through digital technologies in Tourism - A study protocol**

by Sofia Kallou, Aikaterini Kikilia, Michail Kalogiannakis, Nick Zacharis
Abstract: In today's era of globalization and intense competition between tourism businesses, employees distinguished for their emotional abilities, good interpersonal relationships, and teamwork, contribute to the quality and efficiency of the provided services. In this regard, the need for new training and educational programs in Emotional Intelligence in the tourism sector is more than ever relevant. Moreover, the new challenges that arise in education and training lead to the adaption of digital learning environments, and new teaching methods. Furthermore, Transformative Learning, as an adult learning theory, leads individuals, through critical reflection and constructive dialogue, to evaluate their past values and beliefs and shift their world view implementing new perspectives and attitudes which are more functional. The purpose of this protocol study is to investigate the learning effectiveness of Transformation Learning as a pedagogical tool for the development of EI Intelligence for tourism employees, through digital learning technologies.

Keywords: *Emotional Intelligence; Transformative Learning; tourism; education and training; digital technologies; learning development;.*

- **The Impact of the Learning Shift During COVID-19 on Students Using Natural Language Processing**

by Hadil Shaiba, Maya John
Abstract: On March 9, 2020, Saudi Arabia has proclaimed the temporary transition to remote learning due to COVID-19. We underline students' perspectives on this abrupt transformation. We generate a word cloud based on the students' responses concerning the rapid transition. The feedback based on emotions was classified and a word cloud for each emotion was generated. For better decision making and improved strategies, we highlight the major problems and benefits of remote learning and provide some recommendations. Students have experienced a variety of hurdles, including the lack of an adequate study environment, and technical difficulties, particularly when taking exams. Many were under psychological pressure. Others saw an increase in cheating. Some struggled to work with their peers on group projects, some sought tutoring, and others faced financial difficulties. Online practical sessions were found to be unsuitable for some disciplines. The flexibility of learning and saving money and time were the main advantages of remote learning.

- **The effect of virtual and augmented reality on teaching crystal structure of materials and student reflections in applications**

  by Mustafa Serkan Abdüsselam, Sema Çildir, Selçuk Atasoy

  Abstract: The purpose of this study is to examine the effect of a teaching material, developed with virtual and augmented reality technologies and used in teaching the contents related to the crystal structures to the engineering students, on the academic achievement of students. This study was conducted using the mixed method, and 23 students studying at an engineering faculty of a state university participated in this study in 2019-2020 Fall Semester. According to the results of the achievement test, the difference between the application scores in the test was significant, and these technologies contributed to the teaching of the crystal structures of the materials. When the data were analysed in terms of students' skills of drawing 3D figures, mathematical processing and explaining the content, it was found that these three skills improved in all students in a positive way.

- **MOTIVATIC WEB: a collaborative work tool for higher education professors**

  by Gabriela Ramírez Barajas, Rosa A. Sierra Torrecilla, Aura Cecilia Pedraza Avella, Martha L. Torres-Barreto

  Abstract: The objective of this research is to present the development process of the educational tool MOTIVATIC WEB, which seeks to offer professors, regardless of their geographical location, the possibility of working collaboratively, leading to the transformation of classical educational paradigms, by improving competencies and skills of educators through informal training processes such as interaction, collaboration, collective decision-making, and exchange of experiences. For this, a methodology composed of four phases is executed, (i) an identification of characteristics in collaborative work tools offered on the web, (ii) a validation of them following a user-centered design process with a group of professors at national and international level linked as experts, (iii) a conceptual modeling for the determination of functional and non

- **Social and emotional learning for early childhood teachers teaching online**

by Corinne Brion

Abstract: Teaching is one of the most stressful professions. When teachers are stressed, it affects their well-being, job satisfaction and performance, as well as the behaviours and work of the children under their care. Social Emotional Learning (SEL) aims to improve wellbeing of self and others through understanding and enhancing how individuals socially and emotionally interact. When implementing SEL into educational settings, the primary focus has been directed towards students. However, when adults do not pay attention to their own social emotional health, they are not able to attend to the emotional well-being of their students. The purpose of this qualitative study was to understand how early childhood educators took care of their own social and emotional needs while teaching online during the COVID-19 pandemic. Findings indicated that despite challenges, the teachers met some of their social and emotional needs in terms of belonging, mastery, interdependence and generosity.

- **Sample design challenges: An educational research paradigm**

by Kalliopi Kanaki, Michail Kalogiannakis

Abstract: The primary factors that determine the quality of a study are the suitability of the methodology adopted and the research tools employed. Still, very important aspects that may enhance or weaken the robustness of a study are the sampling strategy and the sample size. Aiming at facilitating novice researchers to overcome obstacles concerning sampling, this paper discusses the relevant theoretical framework, answering the question of which steps to go through in a research study in order to conduct effective sampling. It also provides information on our experience regarding designing and implementing an educational research sampling. The valuation of the study outcomes confirmed the importance of conquering the sampling theory, driving us to the conclusion that, even in the case of carefully designing the

sampling process, researchers have to remain vigilant about addressing sampling issues that might occur during the research process, reinforcing the reliability of their work.

• **Digital Transformation in Indian Higher Educational Institutions: A Qualitative Exploration of Administrators Perspectives**

by Ramprrasadh Goarty, Kriti Priya Gupta

Abstract: The present study aims to understand the factors influencing the digital transformation of various administrative and academic processes in higher educational institutions (HEIs). Furthermore, these factors are mapped to different contexts within the Technological-Organizational-Environmental (TOE) and Technology, Pedagogy, Content Knowledge (TPACK) frameworks. The study takes a qualitative approach comprising in-depth semi-structured interviews. The qualitative data is analyzed through a thematic analysis to identify the drivers of digital transformation in HEIs. We identified eleven influencing factors that were categorised under four dimensions of TOE and TPACK frameworks, namely, technological factors, organisational factors, environmental factors and teachers knowledge related factors. The findings indicate that the digital transformation in administrative processes is primarily influenced by organisational and technological factors, whereas the digital transformation in academic processes is primarily influenced by environmental factors and teachers knowledge related factors.

• **Empathy or Students' Activation? factors affecting students' remote learning experience during the COVID-19 period**

by Hagit Meishar-Tal, Ariella Levenberg, Eyal Rabin

Abstract: Due to the COVID-19 pandemic, higher education institutions worldwide were required to shift to an online mode of studying abruptly and without preparation. The purpose of the current study was to examine students' remote learning experience, explore the relationship between the learning experience, the level of student engagement, and the perceived lecturers' performance in terms of empathy and students' activation. A survey questionnaire was

distributed online to students from various academic institutions at the end of the second semester of the academic year. A hundred and twenty students participated in the study. The findings showed that students' cognitive and physical learning experience was moderate and social experience was low. Lecturers' empathy and students' engagement were significant predictors of students' learning experience. Lecturer-initiated activation of students was a negative predictor of the learning experience. The findings are discussed in light of lecturers' role in times of crisis.

Keywords: COVID-19; learning experience; higher education; empathy; active learning; engagement.

• **Socio-Technical Innovation by Female Entrepreneurs: Evidence from the Jordanian Tourism Sector**

by Areej Aloudat, Kimberly Gleason, Hala Bashbsheh, Baker Ahmad Abdullah Alserhan, Jusuf Zeqiri

Abstract: In this paper, we explore the role of female entrepreneurs in socio-technical innovation in the context of the Jordanian tourism sector. Using a qualitative research approach, we investigate how these entrepreneurs innovate, transforming the perception of conservative societies perspective on women entrepreneurs. We document five forms of socio-technical innovation achieved by Jordanian female entrepreneurs in the tourism sector: cultural/societal, economic, stewardship, sectoral, and personal. The article provides interesting insights on women entrepreneurs as innovators in the tourism industry by documenting what they consider to be their most important innovations.

Keywords: entrepreneurship; socio-technical innovation; transformation; social change; innovation; women; tourism industry; less developed countries.

• **Project Based Pedagogical Inevitability and Social Media Impact**

by Prachi Palsodkar, Yogita Dubey, Prasanna Palsodkar, Preeti Bajaj

Abstract: Enforced Pandemic online learning has raised the opportunities of quality learning and derived numerous learning methodologies with the intense influence of social media platforms. Project Based Learning (PBL) is greatly poignant in engineering discipline with Social Media (SM) assistance. Cutting edge technology and Industry-tech innovation demands higher skill set apart from

routine learning. Real use cases in PBL enhance creativity, critical thinking and prepare learner to deal with challenges of workplace. Community and SM reinforced learning acts as a virtual teacher for successful PBL implementation. SM supported PBL provides lifelong learning lessons. SM assisted PBL is carried out for Machine Learning (ML) course using different use cases. Modalities like open online course, SM, community support and PBL, shows 18% students carrying higher impact and 81% students upgraded their skill in real-life problem solving. Study shows 100% students gained a skill in solving real-life problem and achieved all graduate aspects magnificently.

Keywords: Project Based Learning; Higher education; Pedagogy; Social Media; Machine Learning; Engineering.

- **The Land of Mathematics: comparative analysis and design of a serious game for basic arithmetic** 🖥
  by Miltiadis Frydas, Stelios Xinogalos

  Abstract: Mathematical thinking and skills are considered important for individuals both during their school and professional lives. However, young students face great difficulties in comprehending mathematical concepts and lack the necessary engagement. Serious games can help them deal with these difficulties and provide possibilities for an enhanced learning process of mathematics. Several math games are available, but in many cases they are not designed according to established principles and/or they do not integrate mathematics in the game mechanics. The aim of this article is to review and comparatively analyze math games for basic arithmetic using as criteria elements of the Conceptual Serious Games Design Framework. This comparative analysis provides a clear picture of the current situation in the field of math games and is used for designing a new game called The Land of Mathematics that aims to integrate the mathematical concepts directly in gameplay.

  Keywords: serious games; educational games; game design; mathematics; primary school.

- **Adopting Student Response System in Online Ethics Learning: Practice and Evaluation** 🖥
  by Ken C.K. Tsang, Alvin Y.T. Wong, Ivy Chan, Simon C.W. Wong, Joseph C.H. So

  Abstract: The student response system (SRS) adds interactive elements

in classrooms. Students can use their handheld devices to share their views actively during in-class polling. For ethics learning, it can facilitate free exchanges of ideas in a judgement-free environment and effectively arouse participants interest and inquiry of ethics. In a community college in Hong Kong, two ethics seminars were shifted from face-to-face to face-to-screen mode due to COVID-19 pandemic. They were blended with a popular SRS, Poll Everywhere, to facilitate opinion sharing. Other than verbal discussion, students participated by casting their choices about some ethical dilemmas in real-time through Poll Everywhere. Post-activity survey reflected that the approach of adopting SRS in online ethics learning facilitated participants to express their views, increased participants engagement, and provided participants psychological safety to share opinions. The learning mode contains the nature of both interactivity and sincere sharing, and hence is specifically fit for ethics education.

Keywords: educational technology; student response system; online learning; ethics learning.

- **Flipping the focus: An innovative design strategy to support technology integration in teacher education**

  by Lisa Jacka

  Abstract: Initial Teacher Education (ITE) students are exposed to educational technologies through faculty modelling, content delivery, and personal use. However, translating knowledge and skills into PK-12 school integration remains elusive for many graduate teachers. The research in this paper illustrates an innovative approach to shift ITE students mindset about PK-12 technology integration. The focus was flipped to explore deep learning competencies as the driver for the use of digital technologies. The new pedagogies for deep learning six Cs provided the framework for the design-based research undertaken between 2017-2020. Data from 113 students revealed that they gained valuable skills and attributes to support their future integration

  Keywords: Online education; innovation; digital educational technology; deep learning; UX design.

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