Reengineering Educational Technology for a Sustainable Future
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Abstract

Articles placed on session of Vol 8 No 4 (2021): Special Issue 3/2021: Reengineering Educational Technology for a Sustainable Future are dedicated to the Journal of Information and Communication Technology in Education (JICTIE). The special issue was composed from thirteen (13) articles selected from the 5th International Conference on ICT in Education, 2021 (ICTE 2021) by the Department of Computing, Faculty of Art, Computing, and Creative Industry (FSKIK), Sultan Idris Education University (UPSI). The selected articles came from four main conference themes which are (1) borderless learning through ICT, (2) ICT innovations and technologies in education, (3) the usage of AR, VR and mixed reality for teaching and learning, and (4) ICT education in primary schools, secondary schools, and tertiary institutions. All articles went through a double-blind peer-review to be published in this journal.

Keywords: education, schools teachers, Covid-19 pandemic, computational thinking, framework, multimedia, application.

INTRODUCTION

This preamble article specified for summarizing the Vol. 8 No. 4 (2021): Special Issue 2/2021: Reengineering Educational Technology for a Sustainable Future which represents a total of thirteen (13) articles. The first (1) article was written by Meng Joo and Yoke Seng (2021) entitled Validating the Effectiveness of Game-Based Learning Approach in the Form of Video Game for Assessing Computational Thinking. The second (2) article was written in Malay Language by Abdullah et al. (2021) in the Malay Language translated as Multimedia interactive 'e-LABS' for Engineering laboratories. Waidi et al. (2021) wrote the third (3) article with a title Development of Food Pyramid Application using Augmented Reality (AR) Technology. The forth (4) article was also written in Malay language which translated as Use of 'TDProbCalt' application among Tuanku Sultanah Bahiyah Polytechnic Students: A Review by Ismail, Hussin, & Husin (2021). Husin, Zamzuri & Ibrahim, Z. (2021) wrote the fifth (5) article title in the Malay Language which in translation means Development of LMS-based e-learning materials for DBM 30033 Engineering Mathematics 3 course at Tuanku Sultanah Bahiyah Polytechnic. The sixth (6) article was written by Anamalai & Yatim (2021) with a title, A Preliminary Observation of Teacher Challenges in Implementing Home-based Teaching and Learning. Ibrahim et al. (2021) wrote the seventh (7) article written in the Malay Language with title translated as Analysis of 'Course Learning Outcome Monitoring' for Mathematics in Engineering Course. The eighth (8) article written in Malay language by Safian@Sofian & Mailok (2021) with a title translated to The effect of Using the POGIL Cycle Adaptation Model on Student Achievement and Interaction for Form Two Mathematics Subject. The ninth (9) article title in the Malay Language translates to The Level of Readiness of Trainee Teachers Towards the Implementation of Computational Thinking written by Napiah & Hashim (2021). Ishak, Wahi, & Azlan (2021) wrote the tenth (10) article titled The Use of Video to Enhance Student' Interest and Skills in the KSSMPK Food Preparation and Manufacturing Subject. The eleventh (11) article was written by Samsudin & Adnan (2021) entitled as Assistive Technology Framework to Diagnosis the Relationship of Spatial Visual Intelligence for Students with Learning Disabilities. The twelfth article entitled WhysoSeriousGame: A Conceptual Framework for Learning Motivation through A Serious Game was written by Mansor et al. (2021). Lastly, the thirteenth (13) article title is the Developing a Game-based Learning Assessment Framework towards Ubiquitous Computational Thinking among Undergraduate Students written by Kin et al. (2021).

ARTICLE DISTRIBUTION

Meng Joo and Yoke Seng (2021) discussed their study in validating the effectiveness of students' understanding in four aspects of computational thinking with the game-based learning assessment. The four aspects of computational thinking are decomposition, pattern recognition, abstraction, and algorithm. They used a mixed method design approach with a quasi-experiment with a pretest and posttest nonequivalent group design. The quasi-experiment was expected to validate the effectiveness of students' understanding on the decomposition, pattern recognition, abstraction, and algorithm aspects of computational thinking with the game-based learning assessment. The qualitative data

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gathered were analyzed using thematic analysis.

On the other hand, Abdullah et al. (2021) conducted a survey during the Covid-19 pandemic to assess the proposed development of interactive multimedia 'e-LABS' as a One-Stop Portal for Transportation Engineering Laboratories using a web-based questionnaire. The survey was conducted online using the Google Form application, with 151 students participating, 98 from Universiti Kebangsaan Malaysia and 53 from Ungku Omar Polytechnic. The data from this questionnaire was analysed using the Statistical Package for the Social Sciences (SPSS) version 26. According to the descriptive data, 68% percent of respondents indicated that online learning (e-learning) is beneficial to their learning. With a mean score of 4.10, the analysis also supported the concept of interactive multimedia development 'e-LABS'. Furthermore, the data showed that the Interactive Multimedia 'e-LABS' was a platform that incorporated a variety of media types, such as visual, audio, and text, to aid in the teaching and learning process in the transport laboratory, with the second highest mean score of 4.07.

Referring to the study of Waidi et al. (2021), a food pyramid application was developed using Augmented Reality (AR) technology for children to better understand the definition of the food pyramid and how to take balanced nutrition according to category level in the pyramid. The ADDIE Model was used as the instructional methodology which has five phases. The results of the analytical data obtained through the quantitative approach that has been used on 22 respondents consisting of children, parents and experts have shown positive feedback on the functionality and usefulness of this application. This had been evident through the results of the study which showed that the percentage of respondents strongly agreed that this developed application was suitable for use by children for learning purposes and the percentage was equivalent to 91.7 percent. The analytical data collected were displayed in the form of tables, bar graphs and pie charts.

In an article written by Ismail, Hussin, & Husin (2021), results from a study were revealed. The study had been carried out to review aspects of use and feedback (polytechnic students) on the TDProbCalt application that had been developed. A survey of semester 3 engineering diploma students in the June 2020 session at Tuanku Sultanah Bahiyah Polytechnic, found that 58% of the 241 respondents stated that they were confused about the use of methods or formulas in Probability. The main reason identified was the students' difficulty in understanding the topic which was caused by their difficulty in understanding the situation given in the question and the appropriate method to solve it. To review the aspects of use and feedback on the use of this application, students responded through a questionnaire provided through online (google form). The results of the feedback, found that overall, the TDProbCalt application had a positive impact where on average each item of the questionnaire more than 80% of students accepted the good use of this application. Therefore, this application is very suitable as one of the teaching aids (ABBM) that can be used as one of the components in Flipped Classroom where students can learn independently through this application.

On the other hand, Husin, Zamzuri & Ibrahim, Z. (2021) described the e-learning project developed

using a platform called CIDOS LMS. It is a management system utilizing MOODLE open-source software. CIDOS LMS is used to develop interactive e-learning materials that include student resources and activities. The most important feature wass to give notes including learning resources and lessons, in the form or format of HTML, Microsoft PowerPoint, or Microsoft Word. Quizzes and Assignments were activities that tested the comprehension of each student and were submitted according to a set time. Chat and Forum was an activity that allows for two-way interaction between students and lecturers. Students could do self-reflection related to what they have learned by using journal activities. The LMS platform provided a database that allowed students and lecturers to see their level of involvement with the available marks. Period time and frequency use of the results of student and lecturer activities could be obtained.

Article written by Anamalai & Yatim (2021) also discussed the education systems struggle to function and achieve their intended goals in the wake of the COVID-19 epidemic. As stated, most educational institutes have shifted to online learning platforms to keep academic activities going. The questions about the preparedness, designing and effectiveness of e-learning were still not clearly understood, where the technical constraints like suitability of devices and bandwidth availability posed a severe challenge. On top of that, teachers were responsible for ensuring the transmission of transparent and high-quality knowledge to students of all levels. The Covid-19 worldwide visible crisis that struck the world, had a variety of effects on a country's economy, society, and politics, as well as the field of education.

Moreover Ibrahim et al. (2021) conducted a study aimed to analyze the value of Course Learning Outcomes Monitoring (CLOM) for mathematics in engineering course for the Bachelor of Education (Computerized Design Technology) program at the Faculty of Arts, Computers and Creative Industries, Universiti Pendidikan Sultan Idris. The objective was to look at the effect of the CLOM index for predetermined learning and teaching. The other objective was to identify appropriate valuation methods to increase the value of the CLOM index. The results showed that the value of CLOM for the 2019/2020 session was 63.17% compared to the value of the CLOM index obtained for the 2020/2021 session which was 73.12%. This indicates that there was an increase in CLOM value of 9.95% for the 2020/2021 session. However, the value of the CLOM index still needed to be improved to reach a more effective level with a value of 75% or above.

A study conducted by Safian@Sofian & Mailok (2021) aimed to determine the effects of the use of the POGIL Cycle Adaptation Model (Inquiry Learning Inquiry-Oriented Process) in mathematical learning especially for high-level thinking questions (HOTS). It used a quantitative approach that is a quasi-experimental design cycle method involving 60 form two respondents who are randomly selected from one of Malaysia's schools. Analysis of this study uses t-test and Pearson correlation. The findings showed that there was a significant difference in achievement $t(29) = 0.033$, $p < .05$, while only the exploration stations and formation stations have a significant relationship that $r = .654$.

In an article written by Napiah & Hashim (2021) referring to a study that stated that the purpose of

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was to identify the level of readiness among pre-service teachers on implementing Computational Thinking (CT) in schools. CT has been included in Malaysia School Curriculum since 2017 in many subjects, however not all pre-service teachers are aware of this. Therefore, this study was conducted to identify the level of readiness in terms of knowledge, skills and attitudes among the pre-service teachers. A total of 283 pre-service teachers from 11 different study programs in one local university have been selected as respondents using a stratified random sampling method. Online questionnaire has been used and data was analysed using SPSS software to obtain descriptive information, while inference information was analysed using Mann-Whitney U and Kruskal-Wallis tests after the normality tests using Kolmogorov-Smirnov and Shapiro-Wilk test found abnormal data distribution. The results showed that the level of readiness among pre-service teachers was high with mean knowledge aspect (2.86), skills (3.82) and attitudes (3.85). The results of Kruskal-Wallis test showed that there was a significant mean difference in the level of readiness between the study programs with the knowledge aspect ($x2(10, N = 283) = 55.801$, $p = .000$) and skills ($x2 (10, N = 283) = 31.437$, $p = .000$). However, there was no difference in attitude ($x2 (10, N = 283) = 10.880$, $p = .367$). The findings showed that there was a difference in the level of readiness between different study programs as pre-service teachers in some study programs had not been exposed to CT at all.

Ishak, Wahi, & Azlan (2021) conducted a study to find solutions to increase students' interest and skills in the subject of Food Preparation and Manufacturing (PPM) using video recording, as the Covid-19 pandemic caused students to be less interested in taking classes online. The study had been conducted in Sekolah Menengah Kebangsaan Kg. Dato 'Seri Kamaruddin (SMK KDSK) under PPKI, involves students with moderate functioning such as students with Autism, ADHA, Intellectual Disabilities, and Specific Learning Disabilities. Data collection was done through questionnaires and interviews with 20 students of PPKI SMK KDSK. There were 10 question items constructed from previous researchers and all students answered the questionnaire. The analysis used was descriptive and qualitative analysis. The quantitative approach used was survey research. The findings of the study showed an increase in the interest of students to follow the Teaching and Learning from Home (PdPr) online. This teaching method could also be extended to other subjects. Pupils also showed high seriousness and interest in the subject of PPM.

In addition, Samsudin & Adnan (2021) proposed an assistive technology-related framework for the diagnosis of Visual Spatial Relationship (VSR) among LD students. A library study was conducted to see the appropriate factors and elements to produce assistive technology for the diagnosis of VSR among Learning Disabilities (LD) especially Dyslexia and Autism students. This proposed framework could contribute to improving and diversifying methods of diagnosing VSR, especially among LD students.

Mansor et al. (2021) produced an article based on the process of constructing a framework for serious games' motivation in learning. Additionally, it attempted to emphasise the importance of motivational factors as an integral component of serious games for university students. Existing research on serious games for university students' learning is insufficient, and students have reported being

discouraged from exploring serious games in their learning. Thus, the objective of this paper was to develop the WhysoSeriousGame framework in order to provide a comprehensive, serious game-based framework that emphasizes motivation as a critical aspect of learning.

Article written by Kin et al. (2021) discussed a working study from a research on the usage of a game-based learning assessment framework as a standard guideline to assess undergraduate students' understanding and performance towards ubiquitous computational thinking properly. The objective of this research was to construct an appropriate game-based learning assessment framework to learn ubiquitous computational thinking and to determine the importance of the game-based learning approach. The methods in conducting this research study were mixed methods with Delphi methodology approach. The game-based learning assessment framework was constructed based on results gathered by literature, reviewing papers and afterward questionnaires as an online survey given to experts from game development and computer science fields by phases to answer and validate. The results gathered according to phases were performed using thematic analysis and descriptive statistics respectively.

CONCLUSION

Meng Joo and Yoke Seng (2021) believed that the students' understanding in four aspects of computational thinking with the game-based learning assessment vary in terms of the effectiveness. While a survey conducted by Abdullah et al. (2021) indicated that online learning (e-learning) is beneficial to their students' learning during the Covid-19 pandemic as this study concluded that the usage of 'e-LABS' platform as a reference source for educational institutions, particularly in transportation engineering laboratories showed positive results. Next, Waidi et al. (2021) ultimately shared the results of testing on the food pyramid application. It has been shown that this application could work well for the purpose of learning about the food pyramid to children. But there are still some improvements that could be done in future to make this application more adaptable for everyone's use. Accordingly, a survey by Ismail, Hussin, & Husin (2021), indirectly showed good results in using the TDProbCalt application for helping lecturers to deliver the content of the topic more effectively. Husin, Zamzuri & Ibrahim, Z. (2021) concluded that the CIDOS LMS proved to cut the burden of each lecturer and could help their students be more involved with the teaching and learning process. Next, Anamalai & Yatim (2021) summarized the experience of instructors in adopting Home-Based Learning (HBL) with literature sources and prior studies. Ibrahim et al. (2021) concluded that the performance of each assessment performed had a direct impact on the value of the CLOM index for the engineering course. The study conducted by Safian@Sofian & Mailok (2021) implied that the POGIL Cycle Adaptation Model (Inquiry Learning Inquiry-Oriented Process) in mathematical learning especially for high-level thinking questions (HOTS) could be implemented on any subject to improve the achievement of HOTS among high school students. It was also suggested in the study by Napiah & Hashim (2021) that CT-related courses or training should be conducted to expose the pre-service teachers in all study programs with CT knowledge and skills before being placed at schools, as CT is considered as one essential skill needed in the 21th Century. Ishak, Wahi,

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& Azlan (2021) believes that the combination of online and offline technology has a great potential for teaching methods in primary and secondary schools. They also urge that a blended learning approach can be developed as an innovation in teaching and learning for today's generations. Samsudin & Adnan (2021) have a strong belief that the assistive technology-related framework for the diagnosis of Visual Spatial Relationship (VSR) among LD students could help special education educators to plan, develop and implement intervention methods, as well as teaching and learning methods that are adaptable to LD students' ability level, especially in relation to VSR. In addition, work by Mansor et al. (2021) , provided a description on how the framework could be implemented in teaching and learning for university students and served as a source of reference for future Serious Games development. Finally, Kin et al. (2021) concluded that the game-based learning assessment framework was able to assess undergraduate students' understanding and learning performance towards ubiquitous computational thinking as well as be aligned and incorporated into computing curriculum.

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