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Teachers' perception on using cloud based technology and augmented reality in higher education

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Abstract: When a course's content is given using a proper approach and aided by the integration of technology, learning enhancement can be attained. Although this integration is based on the Technological Pedagogical Content Knowledge (TPACK) approach, educators may be reluctant to include technology into their lesson plans if they have not received training that stresses using technology in the present. As a result, educators in higher education require a training program based on the experiential learning paradigm for integrating cutting-edge technology in the classroom, such as cloud-based applications and augmented reality. As a result, the current study builds an educational technology and augmented reality learning module for instructors in higher education institutions in accordance with Kolb's experiential learning theory. In a case study that was carried out in a classroom, 15 teachers took part in the learning activity using a formative assessment approach and cloud-based technologies, including educational technology (EdPuzzle, Nearpod, Socrative, Formative, Kahoot, and Quizziz) as well as augmented reality (HP Reveal). The case study's findings showed that the module was well received in terms of engagement, interaction, competency, and curiosity. The educators who participated in the module also gained knowledge and skills. As a result, using cloud-based tools for cutting-edge educational technology in learning modules based on experiential learning theory boosts educators' readiness and perception of incorporating technology into their lesson plans. In order to boost interest in and foster good attitudes toward learning in learners as well as educators, it is important to promote active learning in higher education.

Keywords: TPACK; Konl's experiential learning; formative assessment; augmented reality; teacher's perception

1. Introduction

Education Technology (also known as “EdTech”) is “the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources” [1]. It involves an area of technology that supports learning in terms of the development of tools and its usage. However, previous literatures have employed the use of EdTech to support one of the important types of assessment (formative). Thus, since formative assessment is a flexible and informal way of assessing students’ progress and their understanding of a certain subject matter [2], the use of a cloud based EdTech tools for formative assessment has therefore recently become practical as seen by [3] with the use of Nearpod, [4] who used EdPuzzle, [5] with Quizziz and [6] who used Socrative in their respective studies. Furthermore, the use of augmented reality (AR) that combines real and virtual information has been widely employed in teaching and learning [7], particularly to attract students’ engagement [8,9]. Other than that, the use of cloud based AR such as HP Reveal has also gained popularity [10,11]. In view of this, by employing the cloud based tools, the assessment can be run in a class using multiple devices, such as smartphone, tablet and laptop. The use of these methods can lead to instant feedback as long as the devices are connected to the internet. However, the preliminary data of the present study indicate that some teachers and educators are still lacking in regard to the usage of cloud based tools, which makes them prefer to ask these three questions verbally during the class in order to identify students’ comprehension during a lesson:

"All understand?"

"Have a question to ask?"

Therefore, technology training is the solution for educators in integrating their teaching with technology. Other suggestions involve having more direct exposure to the integration of technology into content and pedagogy, as well as more practical practices [12]. Additionally, the core of the training should focus on the context in which the technology is applied, instead of only focusing on which technology is useful. Therefore, a balance between practical hands-on examples and the theory behind the use of technology is needed [2]. The first objective of the present study is to investigate the readiness of educators based on their experience in an experiential learning module using EdTech and AR tools. The readiness is measured through engagement, interaction, competency and interest element. Conversely, the second objective is to identify the differences in terms of knowledge and skills after experiencing the learning module.

2. Method

2.1. EdTech and AR based experiential learning module

An experiential learning module is designed based on Kolb’s learning model, which emphasises on experience in the learning process. The model consists of four phases; (i) concrete experiences, (ii) reflections/observations, (iii) abstract conceptualisation, and (iv) active experimentation. Experiences learning from concrete experience phase are the basis

for the reflections or observations phase. The reflections are further understood and extracted into abstract concepts. This abstract concept is then drawn to suggest actions that can be experimented actively to test the implication of actions [13]. These phases are included in the module, in which the core of the experiential activities is structured based on the TPACK model as shown in Figure 1.

In the present study, the target subjects for the study are educators in higher education institution who are interested to join a hands-on workshop. The educators experienced using the EdTech tools and AR in learning context through the conducted workshop, using the experiential learning module as an experiment. Teaching plans based on the TPACK model were used in the first phase of the module, which is considered as concrete experience as shown in Figure 1. A topic for an undergraduate course which is mobile technology was selected as the content, while the formative assessment process was selected as the pedagogy and the technology tools were selected based on Table 1. In this table, the technology tools are divided based on types of questions. Also, the educators had to sign up certain tools and played their role as students in giving answers for the formative assessment. In this case, they experienced a number of cloud based tools for formative assessment and a tool for the AR.

After having experience in using the EdTech tools and AR in a learning context, the educators gave their comments and shared their experience in using the hands-on tools as well as other cloud based tools that have not been used in the workshop. This is the stage for reflective or observation. There was also time for a coffee break for further discussion. After using a series of tools for formative assessment, the educators made the relationship between the use of tools and the content in structuring a teaching plan that focused on formative assessment. At this stage, the educators make comparisons with their existing methods in teaching and what they have learnt from the hands-on module, making up the abstract conceptualisation phase. During the active experimentation phase as shown as the fourth phase in Figure 1, the educators were asked to apply the strategy used in the training module in integrating technology to their own courses. As such, they were requested to sketch their teaching plan based on the three phases (pre-class, during-class and post-class) and to select a number of tools from Table 1 or from their own experience to support their teaching plan.

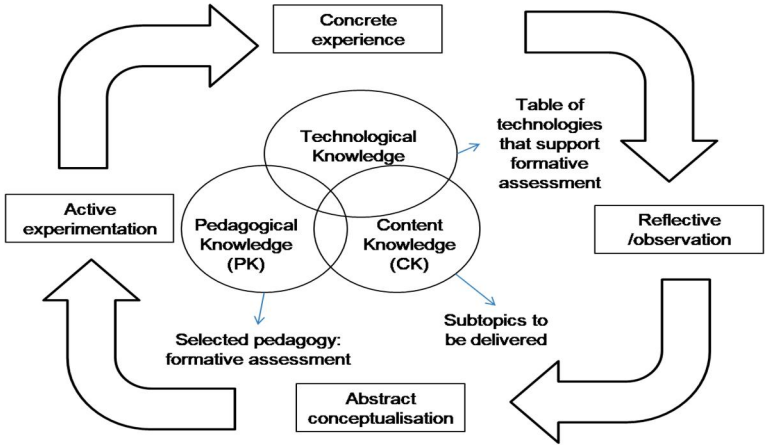

Figure 1. Experiential learning module based on TPACK model and Kolb's experiential learning model.

Table 1. A list of tools for formative assessment.

	Types	EdTech tools based on cloud services
1	Multiple choice	Socrative, Nearpod, goFormative, Kahoot, EdPuzzle
2	True/false	Socrative
3	Short answer	Socrative, goFormative
4	Discussion	Kahoot
5	Survey/Poll	Kahoot, Nearpod
6	Drawing	Nearpod, goFormative
7	Open ended question	Nearpod, edPuzzle
8	Fill in the blanks	Nearpod
9	Games (with augmented reality	Kahoot, Nearpod+ HP Reveal, goFormative + HP Reveal
10	Assign videos with questions embedded	edPuzzle

2.2. Questionnaire

After completing the experiential learning module, a set of experiential activity questionnaire was distributed to the educators. The questionnaire was adapted from [14]. The questions employed a five-point Likert scale; 1-very disagree, 2-disagree, 3-slightly disagree, 4-agree and 5-very agree. This study focuses on 4 and 5 responses from the educators. The respondents also have to indicate their level of knowledge and skills to the related area before and after the conducted workshop.

3. Results and discussion

3.1. The level of educators' readiness to implement technology

Summary of the descriptive statistics for the experiential activity questionnaire is shown in Table 2. The results indicate that the respondents consist of three associate professors, seven lecturers and five tutors who gave positive responds for Engagement (ENG), Interaction (ACT), Competency (CMP) and Interest (INT). All of the items received 100% agreement for scale 4 and 5 except only two items with 93.33% agreement.

The respondents showed engagement during the experiment as they participated actively in activities during the concrete experience phase. The proof of participation can be seen from cloud based tools; Nearpod, goFormative and Quizziz. Furthermore, elements of engagement have high values for very agree and agree as shown in Table 2. It was also observed that the hands-on session made them excited to do the activities as commented by one of the educators.

Table 2. Summary descriptive statistic for experiential activity questionnaire.

Orientation	Survey's factors	Frequency 4 Agree	Frequency 5 Very Agree	Percentage
ENG	The activity was enjoyable	5	10	100%
	The activity was interesting	4	11	100%
	I was engaged in the activity	5	10	100%
ACT	Interacting with other students	7	7	93.33%
	Discussions with other students	6	9	100%
CMP	I learned how to integrate technology in a teaching plan	5	10	100%
	Participation in this activity enhanced my learning skills in using educational technology	8	6	93.33%
INT	The participation of this activity enhanced my curiosity and interest in this area	6	9	100%
	Participation in this activity encouraged me to use the learned technique in teaching	7	8	100%

3.2. Differences in the instructors' knowledge and skills after the activity

In the present study, the educators' knowledge and skills were determined. The respondents had to indicate their level of knowledge and skills to the related area before and after the conducted workshop based on a five-point Likert scale; 1-weak, 2-less good, 3-medium, 4-good and 5-very good. A Wilcoxon signed-rank test was conducted to examine the differences of educators' knowledge before and after the workshop was conducted. The Wilcoxon signed-rank test shows that there is a significant difference at $p <. 05$. The result is also significant at $p <.05$ for educators' skills. The proposed module allows the educators to experience how EdTech and AR are integrated with teaching plan, thereby enhancing educators' learning experience as well as increase knowledge and skills. The followings are the comments from the educators involved in this study about the acquired knowledge:

"A lot of new teaching techniques"

"Learnt something new"

"Technology to improve teaching and learning"

The increase of knowledge is contributed by the hands-on session during the activity. This is the results of the transformation of experience into knowledge through the learning process.

4. Conclusion

This study shows that the experiential learning module based on EdTech and AR has a positive impact towards the educators' readiness in using technology for formative assessment. Conversely, the educators show positive responses for engagement, interaction, competency and interest. Also, the knowledge and skills of the educators are found to be

higher after using the experiential learning module. This shows that giving a pre-identified teaching plan based on TPACK and Kolb's model, can give the educators the experience in learning in such environment. Based on this experience, the educators will be aspired to utilize the technologies in class since they already understand the impact of using certain technology tools in teaching and learning. More so, since there are vast choices of tools in EdTech that narrow down of usage to only cover formative assessment, which can give the educators a starting point to begin integrating technology as there are more than 50 tools available for formative assessment only. This study hopes that the proposed training module could be extended to cover other pedagogy methods or implement collaboration during assessment by using certain technique, such as Think-Pair-Share in order emphasize more on active learning in higher education.

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