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Virtual Reality-Based Education (VRBE): Understanding Students' Readiness and Expectancies

Shahrul Mizan Ismail, Harwati Hashim

Abstract*: Driven by the rapid advancement in the field of Science and Technology, students regardless of areas and programmes are now exposed to a variety of immersive technologies. Therefore, it has become a challenge for educators in designing a meaningful learning experience. The use of such technologies has led to the emergence of new approaches in a learning experience, namely one that involves Virtual Reality (VR) and Augmented Reality (AR). Thus, understanding students' readiness and expectancies is very important in leveraging the use of these technologies in teaching and learning. This study was conducted with the aim of addressing 2 objectives which are to identify the level of readiness of law students at the Faculty of Law, UKM in using VR in their learning; and, to identify the students' expectancies when using VR in learning. Questionnaires were used to obtain data that were intended to measure the student's readiness and expectancies. The findings showed that most of the students at the Faculty of Law have the technological readiness to use VR in their learning in law classrooms. However, some considerations need to be taken especially the availability of devices which does not ensure the existence of total willingness to accept something as new as using VR in a law class. As a conclusion, the findings of this study have brought into attention that VR technology can be used in law classrooms despite its discipline which has always been traditional (lectures and tutorials) and conventional (numerous readings, note-takings, and listening). However, the preparation of students' affective domain is crucial especially in providing them with the strategies to learn with the help of VR technology.

Keywords* : Virtual Reality-Based Education (VRBE; VR; Students' Readiness and Expectancies; law programme.

I. INTRODUCTION

The world is changing at a rapid pace, driven by science and technology. Advanced by the evolution of new technologies in wireless communication systems as well as hardware and software for mobile devices, technologies have open abundant new pathways and opportunities in education. Since students are now exposed to a variety of immersive technologies, designing a meaningful learning experience for them becomes more challenging [1].

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***** Correspondence Author
Shahrul Mizan Ismail*, Faculty of Law, Universiti Kebangsaan Malaysia, Selangor, Malaysia.
Harwati Hashim, Faculty of Education, Universiti Kebangsaan Malaysia, Selangor, Malaysia.

At the same time, real-time assessment and effective feedback during the learning process becomes highly necessary, as well as the ability for students to work at their own pace [2]. Numerous institutions are transforming their teaching and learning approaches, to be at par with technological advances, so that they may improve how their instructors engage with students, create interactivity surrounding their learning process and innovate around new pedagogical techniques [3]. The use of such technologies has led to the emergence of new approaches in the learning experience, namely one that involves Virtual Reality (VR) and Augmented Reality (AR).

The potential of VR and AR technologies in stimulating active learning has been widely recognized. A number of academic institutions have developed research programs to study how these technologies enhance the effectiveness of teaching and learning in their classrooms. For example, VR enables students to view abstract concepts, observe events, and visit environments, and interact with events that make distance, time, or safety factors unavailable [4]. This paper extrapolates the possibility of enhancing the learning process in a law class in UKM. Since VR is one of the potential tools for active learning and meaningful learning experience, it is worth to look into students' readiness and expectancies so that students will not be reluctant to use VR in the future in law courses. Hence, it is important to understand the students' readiness and expectancies to ensure its effectiveness in teaching and learning. Therefore, this study was conducted with the aim of addressing 2 objectives which are (i) to identify the readiness of law students at the Faculty of Law, UKM in using VR in learning; and, (ii) to identify what are the students' expectancies when using VR in learning.

II. VIRTUAL REALITY IN LAW CLASSROOMS

Virtual Reality (VR) is a software-generated artificial environment that is revealed to the user so that the user accepts it as a real environment. VR is experienced primarily by two of the five senses, sight and sound [2]. There are various applications of AR and VR including entertainment and educational purposes. For example, using AR in gaming like Pokémon GO, using phones plus location and graphics processing to generate images that will then superimpose on the real world, allowing players to go to real spots to find and capture virtual monsters. VR gaming, however, provides far more exciting prospects compared to AR, because it takes the client into the game itself.

The user becomes the avatar instead of controlling an avatar on a screen, and her body's physical movements translate into the world that she perceives around her. The results of innovation can be impressive even at this early stage.

Previously, a small team of law students and school employees from the Dallas College of Law University of North Texas created a virtual reality crime scene. There was blood made of ketchup, a stapler, handprints and a dead body [5]. Using a 360-degree camera, the team presented an imaginative crime scene. In another example, the team built out a replica "crime" scene for students to investigate in an insurance law case. The team modelled important evidence like a screwdriver and a shotgun, and using Oculus, a virtual reality software, students were able to investigate the case in three dimensions, take screenshots, and annotate as they see fit [5]. Some law schools that experiment with VR technology focus on creating videos that can be used to complement classes. They use 360-degree cameras to create immersive experiences in this process.

III. STUDENTS' READINESS AND EXPECTANCIES

A. Students' readiness

Mobile learning now plays an important role as a supplement to formal education [6] [7]. Technology for Virtual Reality (VR) has been widely proposed as a major technological advance that can provide considerable support for such education. VR technology is expected to facilitate the learning process in several ways. With the usage of mobile devices in education being a regular occurrence, it is wise to incorporate VR technology into mobile applications as current mobile devices have technologies that could benefit VR with its variety of sensors and a camera that is already built into smartphones [8].

However, before implementing a new method or technology in learning, there is a critical factor need to be considered in determining whether a technology will be successfully implemented or not, and that is the readiness of the students. Although there are plenty of online resources and information about construction technologies, as part of their learning process, students should have the ability to accept and use the software [9]. Therefore, the readiness level in this study will be referring to the student's readiness in using VR application, and it will focus on the student's preference and applicability in using VR with a mobile phone in the learning process.

B. Students' expectancies

Expectancy is also known as anticipation, is defined as the act or state of expecting. Expectations could be expected or predictive, which, in this study, could be students' predictions of or beliefs about learning process using VR. According to [10], students' behaviour, as well as their academic achievements, satisfaction, and aspiration are related to the learning environments in many ways. Therefore, interest has grown in evaluating students' expectations and perceptions of the educational environment in universities. [11] in his study has explored and wrote regarding student's technological expectancy towards e-learning system which used the expectancy-value theory in order to predict that student's behavioural intention is due to their technological expectancy and educational compatibility. Previous researchers identified four general technological expectancies among students, which are, performance expectancy, effort expectancy, social influence and facilitating conditions as the dominant construct toward technological expectancy [11]. Performance expectancy refers to an individual believes that using the technology would improve performance. Meanwhile, effort expectancy is whether a product is easy to use [12].

IV. METHODOLOGY

A. Research design

This study was conducted with the aim of addressing the 2 objectives which are (1) to identify the readiness of law students at the Faculty of Law, UKM in using VR in learning; (2) to identify what are the students' expectancies when using VR in learning. Data were collected using questionnaires, which was intended to measure the student's readiness and expectancies. The survey was divided into 3 sections, which are (1) Basic information; (2) Students' readiness; (3) Students' expectancies. Data collection was done before the demonstration of the VR application to the students.

B. Sample

Undergraduates who enrolled in law degree programme at *Universiti Kebangsaan Malaysia* participated in the study. The focus of this study was on the final year students who were taking Civil Procedure (UUUK 4053) course.

C. Instrument

The first section (basic information) of the questionnaire form was constructed with the aim of collecting the students' background data and identify the students' demographic. The questions solely ask the students regarding their age, gender, academic year and basic knowledge regarding VR and mobile learning. The second section of the questionnaire is a closed format question which consists of 12 questions intended to measure the student's readiness toward mobile VR, the availability of mobile devices, access to the internet and the students' knowledge and experience in mobile VR. This survey has been used in the previous studies conducted by [13], [14] as well as [15]. The scale ranged from 1- Extremely Likely to 5- Extremely Unlikely. The third section contains 13 statements of a five-point Likert that is developed to evaluate students' expectancies toward mobile VR. The Likert scale is used in similar studies regarding students' perception of the expectancies of mobile learning [16] [17]. The question has been modified to appear related to mobile VR. The scale ranged from 1- Very Accurate to 5-Very Inaccurate.

D. Data analysis

Data were reported using means and standard deviation. The interpretation of the means is based on [18] which are categorised as follow;

Table 1: Interpretation of Mean Scores

Mean Score	Interpretation
3.68-5.00	High
2.34-3.67	Average
1.00-2.33	Low

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V. RESULTS

A. Students' Readiness

Table 2 presents the mean scores of students' readiness for each item.

Table 2 Mean score of students' readiness

Item	Questions	Mean	Std Deviation
SRQ 1	I have access to a smartphone	1.27	0.73
SRQ 2	I have internet access on my smartphones	1.47	0.88
SRQ 3	I usually surf the web using my smartphones	1.69	1.02
SRQ 4	I depend on the university's Wi-Fi to access the internet	3.05	1.41
SRQ 5	I have internet access when I'm outside the university	1.74	1.17
SRQ 6	I subscribe to a personal internet plan on my smartphone	1.59	1.10
SRQ 7	I have no problem with using the internet for learning purposes	1.81	1.16
SRQ 8	I use smartphones as an aid to learning	1.89	1.18
SRQ 9	My smartphone is very useful when I'm studying	2.10	1.30
SRQ 10	Learning using smartphones in learning is in my interest	2.56	1.36
SRQ 11	I have knowledge regarding VR	2.69	1.17
SRQ 12	I have heard of learning using VR	2.45	1.27
	Total Mean Score	2.03	

(The scale ranged from 1- Extremely Likely to 5- Extremely Unlikely)

Based on the data collected, the students' readiness level is rather low. This is shown in Table 2 where the total mean is 2.03 out of 5. Surprisingly, even though these students are gen Z learners, their readiness in terms of having the device (smartphone) is rather low. This is shown from the average mean score for SQ1 which is 1.27. Additionally, their readiness in terms of internet connection is also low. Despite having their own mobile data, the students rely heavily on university's Wi-Fi to get access to the internet. This is shown in the total mean score for SQ4 which is 3.05. However, interestingly, in terms of knowledge about VR, the students are aware of VR as the mean scores for SQ11 and SQ12 are 2.69 and 2.45 respectively. This shows that the students somehow realise that VR is coming its way in education. Furthermore, VR can still potentially be introduced in their learning as the students did show some interest in using smartphones for learning. This can be seen from the mean score for item SQ10 which is 2.56. The students may need guidance and instructions in order to use the VR application.

B. Students' Expectancies

For the students' expectancies of using mobile VR, the questions focus on what do students expect when using mobile VR and the potential of VR in learning. Table 3 depicts the mean scores of students' expectancies for each item.

Table 3 Mean score of students' expectancies

Item	Questions	Mean	Std Deviation
SEQ 1	Learning using VR will be beneficial	2.29	0.95
SEQ 2	I would like to experience learning using VR	1.93	1.02
SEQ 3	I am capable of using VR in learning	2.50	1.08
SEQ 4	Training is needed to understand how to use VR in learning	1.85	1.01
SEQ 5	Learning using Mobile Virtual Reality will be interesting	1.99	0.97
SEQ 6	I think I can understand better when learning using VR	2.35	1.04
SEQ 7	Learning using VR will improve the interactive level between peers and lecturers	2.18	1.01
SEQ 8	The curricular will be improved when using VR in Learning	2.28	1.05
SEQ 9	I can visualize better when learning using VR	2.15	0.98
SEQ 10	I can learn independently using VR	2.35	1.12
SEQ 11	I can learn with my classmate using VR	2.30	1.11
SEQ 12	The classroom activity will be more active with VR	2.06	0.99
SEQ 13	I will be more excited to learn using VR	2.00	1.07
	Total Mean Score	2.17	

(The scale ranged from 1- Very Accurate to 5- Very Inaccurate)

Based on the findings, it can be seen that majority of the students expect to somehow benefit by learning using VR as shown by the total mean score for item SEQ1 which is 2.29 out of 5. Based on Table 3, the mean score of SEQ 3 which asks the students "I am capable of using VR in learning" is the highest with the mean score of only 2.50 out of 5. In addition, the mean scores for SEQ 6, SEQ 7 and SEQ 8 which asked the students whether they expect learning using VR can improve their curricular and interactive are particularly average with the mean scores 2.35 for SEQ 6, 2.18 for SEQ 7 and 2.28 for SEQ 8. Furthermore, the students also expect that they can learn independently or with their classmates using VR as shown in the mean score for SEQ 10 (2.35) and SEQ 11 (2.30).

Overall, the total mean for students' expectancies is 2.17 which shows that the students somehow have an average believe that using VR in learning may benefit them. However, this is prior to the demonstration and activity that uses mobile VR in teaching and learning.

VI. DISCUSSION AND CONCLUSION

Technology readiness of students refers to their propensity to embrace new technologies to achieve learning goals [19]. Assessing students' readiness is important in preparing them for 21st Century Learning environment, in Malaysian higher learning education. Implementing a technology-based pedagogy in class, without assessing readiness may impede the process of knowledge transfer, retention, and retrieval. E-learning readiness studies found that the degree of e-learning readiness of students would affect the level of e-learning performance [20] [21].

The absence of suitable devices or their incompatibilities may hinder the effectiveness of the learning experience designed by the instructors. According to [22], many studies assessed students' readiness to use technology by examining several factors such as personal innovation, perceived usefulness, performance expectancy, effort expectancy, social influence, perceived playfulness, self-management of learning, using the Technology Acceptance Model (TAM) and Unified Theory of Acceptance and User of Technology (UTAUT) [23] [24]. In the same article, [22] referred to [25] who concluded that most students in higher learning institutions nowadays are what we commonly call digital natives. This, in other words, means that they are proficient in the use of technology [25].).

Having said that, one must also consider the reality of Malaysian higher learning education where the incorporation of learning technologies combined with traditional in-class teaching is still a struggle for some university instructors and students, and predictors of learning effectiveness remain unclear. On the bright side, however, the adoption of this learning approach is still undergoing development.

The research findings in this study showed that most of the FUU, UKM students have the technological readiness to use VR in their learning in law classroom. However, the availability of devices does not ensure the existence of total willingness to accept something as new as using VR in a law class. It also does not guarantee the willingness to learn how to learn law via VR apps. The discipline of law has always been traditional (lectures and tutorials) and conventional (numerous readings, note-takings, and listening). Hence, the preparation of students' affective domain is as crucial as providing them with strategies to learn with the help of VR technology.

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AUTHORS PROFILE

Shahrul Mizan Ismail is an Associate Professor and Deputy Dean at the Faculty of Law, Universiti Kebangsaan Malaysia (UKM). He is a legal-education technology enthusiast and an e-learning practitioner. His areas of specialization are both in law and educational technology, with emphasis on gamification and game-based learning in higher education, augmented and virtual reality in legal education, mobile learning, technology acceptance as well as active learning.

Harwati Hashim is a Senior Lecturer/Assistant Professor at the Centre for Teaching and Learning Innovations, Faculty of Education, Universiti Kebangsaan Malaysia (UKM). She is an educational technology enthusiast and an e-learning practitioner. Her areas of concentration are ESL, mobile learning, Mobile-assisted Language Learning (MALL), technology acceptance as well as language pedagogy and the use of technology in teaching English as a Second Language (ESL)