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A FRAMEWORK OF VIRTUAL REALITY LEARNING SYSTEM FOR TEACHER'S TRAINEE PROGRAMME AT MALAYSIAN HIGHER EDUCATION

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ABSTRACT

Mobile Virtual reality (VR) learning based has contributed effectively to various disciplines since its implementation in education. However, current pedagogical methods and tools at the tertiary level are unable to provide students with realistic and practical usage of virtual reality due to incompetency and lack of IT skills among educators. The current problem with mobile learning is the visualization and content presented in the application, where it may not be appealing for the student to use because it is mostly text-based. The next issue regarding learning is the user interface where it may not be usable to a non-experience user, and most important is the framework available for the mobile-Virtual Reality Learning System is still limited. This study proposes a framework for using Virtual Reality (VR) system for experiential learning. The framework consists of the following three modules: VR Teacher's Module Knowledge Dissemination, VR Teacher's Learning Preparation Module and VR Teacher's Module Knowledge Assessment. The system prototype will be developed and evaluated with case studies to identify the system's benefits and limitations.

Keywords*:* education, framework, higher learning, virtual reality

INTRODUCTION

There are several benefits of utilizing Virtual Reality a medium for learning, Barreh et al. .[1] stated that Virtual Reality (VR) helps enhance the learning experience by using the 3D synthetic object for students to view the object using their eyesight with various mobile interfaces; the 3D object can be manipulated through interaction. This allows the student to visualize the learning material more clearly with the help of 3D objects and interaction to view how certain objects would react.

LITERATURE REVIEW

According to Nincarean et al. .[2], the student can use smartphones and tablets to interact with VR readymade video, and this allows the student to use VR with the device that they may already have, which allows them to install the application and use it virtually anywhere. Problems that arise that researchers found that education is difficulties in visualizing the learning material, current mobile learning user interface are the complicated and limited framework for developing[3–5]. The researchers motivated mobile Virtual learning system development due to the problems students face while learning which is trying to understand what they are learning. Zarwina et al. .[3] discovered that the current virtual reality learning application lacks interactivity between the student and the device in terms of learning, which is the main cause that factor into students unable to focus what they have learned and make it less memorable. User interface plays an important role in an application; it can determine the level of usability of the application. Corbeil et al.[4] stated non-technical students might have a disadvantage in using the application as it required them an additional learning curve, this means that different people have a different set of skills; a good user interface should allow both technical and non-technical students to use the application with little to no guidance. Another problem that arises is a framework; a framework is used to develop a virtual reality learning system is to ensure that the application achieves what it has set to achieve.

Framework for a virtual reality learning system still lacks in terms of development; having a framework is important especially for a developer to develop an effective learning application[5]. The use of VR used to be limited for computers and laptops, but the current Smartphone is capable enough to handle the processing power. VR can increase the students' attention towards the learning material; exercise was developed to increase the student understanding on the subject[7]. Thus, it enables students to think both critically and creatively that can further improve their learning experiences and understanding.

Nowadays, VR shows great potential in terms of technology with its visualization capabilities. VR technology can make an impact especially on education[9]. The advantages of VR in education can help by integrating teaching and learning for a subject that is difficult to explain[11]. VR can be used to visualize a concept to the student to further understand. However, through meta-analysis conducted by researchers in the present study, the result shows that studies on VR in the education field are still lacking. The use of mobile technology may disrupt the field of education, stated Martin et al. .[9]. However, VR has the most potential when it comes to emerging technology to be widely used, claimed Martin et al. .[9]. The advantage that mobile device has over desktop PC is portability[12], where user can take their mobile devices anywhere, they go. Student visualization skills are further enhanced through VR. This is proven by the statement of Furht[13,] which claims that VR is a visualization tool powerful enough to be used for exploring real-world structures along with additional contextual information. Future researchers are suggested to improve Internet portability[8], which can enable the user to access their system and have updated content whenever and wherever they use it. As a contribution, to help enhance the student experience, VR is one of the appropriate ways to deliver information to students through visualization.

METHODOLOGY

A Framework for Using Mobile VR Learning System for Teachers Training Program

The study aims to improve the safety performance of construction students through mobile-based VR. To achieve the study goal, a framework has been developed reflecting the typical safety education process, comprising of three modules: (1) Safety Knowledge Dissemination (SKD) to transfer safety knowledge to students; (2) Safety Knowledge Reflection (SKR) to allow learners to identify hazards and reflect on safety knowledge, and (3) Safety Knowledge Assessment (SKA) to ensure the students have obtained the required knowledge, as illustrated in Figure 1. The mVRls framework[14] adapted was used in this research. The contents of the application that will be developed- ing is Network Fundamental course. Thus, the proposed framework will name as Net mVRls framework, which aims to assists students who are taking a computer science course to learn networking devices through a multimodal interface with 3D object interaction, image, video and voice. By using the multimodal interface, it motivates the students in learning as well as helping them retain the information longer[14]. The application then will be developed using software tools such as Unity 3D SDK, Vuforia, and Blender, smartphone, and tablets will be used to test the application during pilot testing to ensure all bugs and errors are fixed before deploying in data collection. During data collection, the application will be given to students in several chosen Malaysia universities, where 30 students from each university will randomly select to use the application and get their feedback through the questionnaire given. The following figure shows the flow of the methodology used to develop the Net mVRLS framework.

The next sections thoroughly discuss the details of the system.

1. VR Teacher's Module Knowledge Dissemination

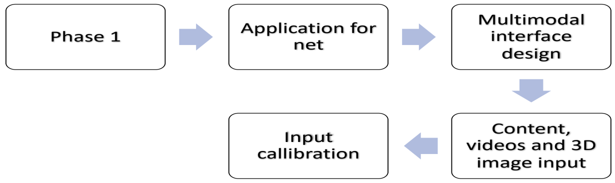
The VR Teacher's Module Knowledge Dissemination focuses on teaching and transferring safety knowledge based on accident cases. Through the cases, educators introduce safety regulations, guidelines, and safe work procedures by using the content. The SKD module is initiated with a case-based learning approach, whereby learners play an active role in brainstorming and get to see how safety regulations and guidelines tie in with safety performance in real construction. In this approach, VR animations are utilized to illustrate learning scenarios, allowing students to visualize the site environments from accident cases. Students are expected to develop a comprehensive understanding of safety regulations based on accident cases. After the lecture, students are expected to be aware and knowledgeable of the hazards associated with the types of construction work considered during the lecture.

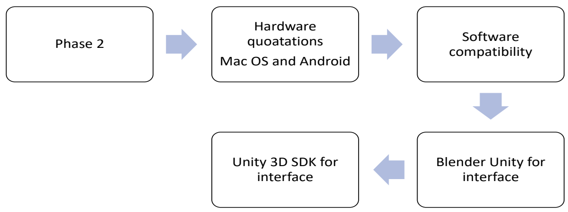
2. VR Teacher's Teaching Preparation Module

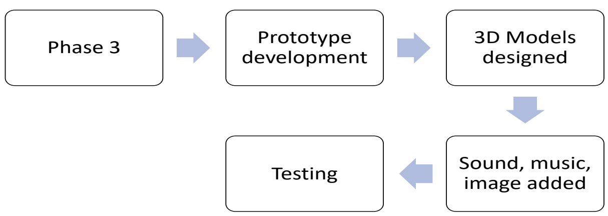
The VR Teacher's Teaching Preparation Module provides students with an experiential opportunity to apply the safety knowledge acquired in the previous module. Students are required to inspect an immersive virtual construction site to identify potential hazards. Firstly, students log in to their accounts and select the SKR bar to access virtual scenarios in mobile devices. Then, via avatars, users navigate and inspect a virtual environment to identify the hazards and unsafe

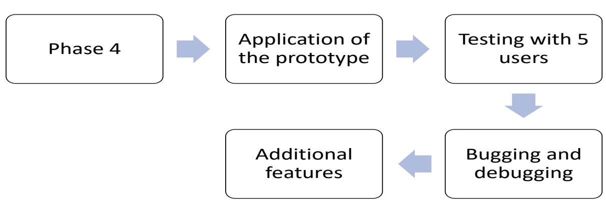
3. VR Teacher's Module Knowledge Assessment

A mobile device such as smartphones and tablets enables people to use it for communication, entertainment, work, accessing the Internet to gain information, as well as learn through instruction. mVR has been made possible with rapid development and increases the usage of mobile devices, as stated by Nincarean et al. .[11]. This allows more users to experience VR by using their mobile devices such as smartphones or tablets through an application that can be easily installed. A combination of virtual and reality methods can increase the understanding of learning[14]. Using VR, the user will be able to experience a virtual environment surrounding them with added digital objects such as videos, audios, images, and touch interaction.


Phase 1
Application for net
Multimodal interface design
Content, videos and 3D image input
Input callibration


Phase 2
Hardware quoatations
Mac OS and Android
Software compatibility
Blender Unity for interface
Unity 3D SDK for interface


Phase 3
Prototype development
3D Models designed
Sound, music, image added
Testing


Phase 4
Application of the prototype
Testing with 5 users
Bugging and debugging
Additional features

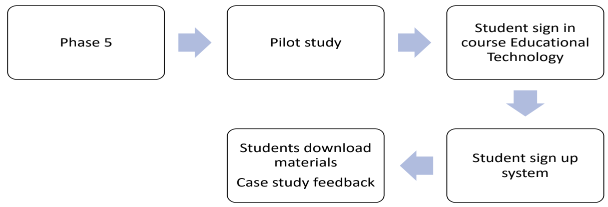


Figure 1: Safety Education Process

In phase 1, the conceptual features to be applied to the application for the Net mVRLS framework will be identified. For this research, the multimodal interface will be used as the primary interface of the application. The multimodal interface has multiple inputs that the user can use to navigate with the application; this includes 3D objects, videos, image, voice and interaction. The multimodal interface provided a positive response from users based on[14] researches. Other than it can also increase the student motivation to learn as well as enabling them to understand better and longer retention of the information.

Phase 2 focuses more on the software and hardware requirement to develop the application. The software that will be used in the research is Unity 3D SDK, Vuforia, and Blender based on previous studies on mVR application[14]. Unity 3D SDK is used to build the user interface of the application as well as importing 3D images and designing the whole navigation interface to allow better usability towards students. Vuforia will be used to store the data of a 3D object in a marker, a marker can be an image or a generated image similar to QR Code, by using a camera to scan it, the 3D object and related information can be shown on display. Blender is used for modelling the 3D object by using a 2D image or schematic to trace and design into a 3D object. The hardware for developing the application is a laptop running Windows 8 OS and above or Mac OS X 10.10 and above. Smartphone and tablet running Android OS 2.3 and above will be used to test the application to find any errors or bugs to fix and to further improve the usability of the application in the fourth phase.

Phase 3 will be prototype development, which will begin after gathering all the required hardware and software; the content used on the application retrieved from Network Fundamental, who provided the PowerPoint slide. The type of device found on the slide, such as a router, switch and hub, will then be used as a reference for the 3D models. The 3D models are then designed by using Blender software; the 3D model will then be imported into Unity 3D SDK to place the 3D object on top of the marker when used in the application. Additional information such as image, video, voice and interaction will then be added. Testing will then proceed in the next phase.

In phase 4, the reliability of the application will be tested through pilot testing, where five students will test the prototype to find any errors or bugs after being exposed to mVRLS and tutorial. They will then answer a questionnaire regarding the application to add additional features if required.

Phase 5 will begin after ensuring the application is ready to be deployed to the student after debugging and fixing errors exists. The data collection phase will take place in four learning cohorts of teacher's training program at Universiti Teknologi MARA (UiTM).

PILOT STUDY

120 students collectively will be involved in the data collection process. 30 undergraduate students from each program will be chosen to take part in the pre-test and post-test evaluation.

In the pre-test process, students will have to answer questions given without any learning material. However in the post-test, students will be split into three groups of 10 each from 30; the first group will be using traditional method (books or pdf/ PowerPoint notes), the second group will use a smart device but without mVRls, and the third group will also use a smart device. Still, with the use of mVRls, they will then fill in the questionnaire distributed to get their feedback.

From the feedback received, the data will be analyzed using AMOS statistical software where PLS, SEM, and CFA will be used to determine the usability of the application and the reliability of the framework formed from the research.

CONCLUSION

In conclusion, mVRLS has a lot of potentials to increase student motivation towards learning with VR. A framework is important when it comes to developing mobile applications especially mVRls. Without a framework, the application would most likely, will not perform according to standards. Besides, the user interface also is a factor in ensuring that the application will be useful to students. It is a hope that a framework for developing mobile learning with VR can help the development of courses offered by Higher Learning Education, especially for public universities in Malaysia, more efficiently used.

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