A Secure Learning Environment Framework of Virtual Reality Application for TVET Education Using Blockchain Technology

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Abstract : The epidemic of COVID-19 has altered the environment in several areas, including education. One of the impacted education sectors is Technical and Vocational Education Training (TVET), which is one of the key drivers of the Eleventh Malaysian Plan. Problems arise when learning processes, assessments, and management are needed to be carried out online. The safety of the Internet is a major concern for universities, teachers, and students. This project presents a blockchain-based theoretical framework for VR applications in higher education and TVET. The use of VR can be considered as a psychological motorized acquisition device that provides an effective online learning experience. Measurement of learning results is performed from a virtual reality simulator using Head Mounted Display (HMD). Through online distance learning, everything is put in the cloud, and everyone can access it. Blockchain, a distributed ledger that records network transactions and data, prevents unauthorized changes. The university administration that offers TVET courses will get to manage and monitor the ODL between student and lecturer without interfering with the process. Any updates on the marks and assessment are recorded and can be viewed in real-time. University administrators manage to reduce expenses and labor for system and internet security. VR will incorporate blockchain technology. This method will make blockchain a possible tool for securing cloud data. Thus, TVET education management, students, and lecturers may have improved learning experiences without worrying about virtual reality safety.

Keywords: Blockchain, TVET education, virtual reality

1. Introduction

In March 2020, the Government of Malaysia announced the Movement Control Order (MCO) due to the infection of COVID-19 in the country. Due to the strict Standard Operating Procedure (SOP) enforced by the authorities, universities and schools are shut down during the MCO period, and online distance learning (ODL) has been introduced. This action also affecting TVET education because the psychomotor domain cannot be assessed using normal assessment methods [1].

Thus, virtual reality (VR) learning is introduced to facilitate the assessment of the psychomotor domain [2]. All outcomes and data obtained using VR will be saved in an online database that will be accessible to all parties participating in the evaluation process. This exposes the data to internet threats such as data leaks, data manipulation, or modification by an irresponsible individual. As a result, this project presents a framework for a secure learning environment that will integrate the current in-demand technology, blockchain technology, to make the virtual learning experience more secure, and all data will be securely maintained.

2. Problem Statement

VR has enabled educators, in particular, to develop interactive environments for students, ensuring that the teaching and learning process runs smoothly even during the MCO. Students may do psychomotor domain assessments using VR. This assessment is particularly crucial in TVET curricula that emphasize technical and hands-on learning [3]. However, the existing VR software available today can only be accessed through cloud-based software.

Since the complete virtual reality simulator is stored in the cloud, it is crucial that teachers and administrators have safe ways of accessing their students' information and grades. Putting anything as private as this onto the cloud might be disastrous. Information may be abused and manipulated. Nowadays, when everything is done online, it is more important than ever to ensure the safety of sensitive information.

Personal information like assessment marks and exam scores are at risk if there are not sufficient security measures in place to protect them [4]. With the availability of blockchain technology, cloud-based data can be protected, and its integrity preserved. Consequently, a safe environment for teaching and learning using blockchain technology is suggested to protect student data and grades during VR learning.

3. Blockchain Environment

This project will examine the use of virtual reality in teaching and learning in TVET education. Based on the research, blockchain technology may be viewed as one of the most promising technologies currently available, particularly in terms of data security. Therefore, blockchain is recommended to safeguard the VR learning and teaching environment in TVET education.
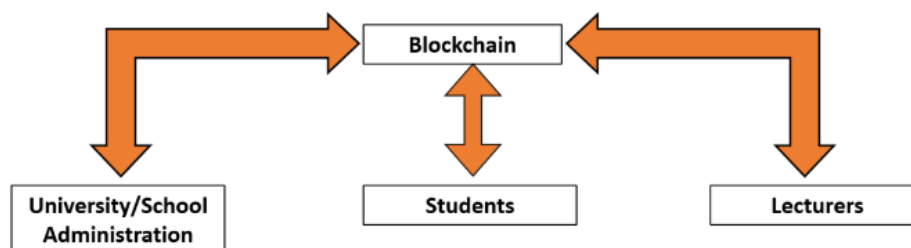

Figure 1: Relationship between Blockchain and TVET entities involved

Figure 1 shows the relationship between blockchain, universities, students, and teachers that are involve in VR learning and teaching in TVET education. Based on the figure, lecturer, university administration, and student are linked to the blockchain ledger to create a safe and secure network environment. Any information that is transferred and shared among them is stored in the ledger and cannot be tampered with or edited.

The lecturer will be able to store all transactions and data on the network without allowing them to be edited without permission. Any updates on the marks and assessment are recorded and can be viewed in real-time. Students can use the Internet to gain access to their lessons and notes. Students will not need to be concerned about safety since the online distribution of grades and evaluations will be secure. While for the university administration, they will be able to manage and monitor the ODL between lecturer and student without interfering with the process.

4. Results and Observations

Since everyone has access to the same database and resources, improving educational quality via VR and ODL makes it simpler to reduce systemic imbalances in education. Blockchain creates a secure environment that allows every entity involved in the ODL to have a safe learning experience. This can make the learning experience more interactive without worrying about the issues related to data misuse.

ODL through VR will act as an alternative delivery method for teaching and learning during global crises such as pandemics or conflicts. Considering that no one knows when the pandemic will stop, a real-time evaluation may help save resources. Additionally, students who use VR won't miss more than half of their regular classes. As a result, the teaching and learning experience is far more beneficial than just having access to internet streaming. **Figure 2** shows an example of how virtual reality may be used in educational settings.

Figure 2: Demonstration of VR for teaching and learning

5. Conclusion

One of the United Nations' (UN) Sustainable Development Goals (SDG) is improving access to high-quality education for all people throughout the world. These goals were established to save the planet and improve people's living standards and future opportunities [5]. In the last decade, significant strides have been achieved to broaden participation in the educational system. Since 2020, when pandemics began striking our country, there has been a significant reduction in the number of students able to attend school and a corresponding increase in security concerns. Thus, VR can make teaching and learning about TVET more effective, and blockchain technology can keep the environment safe.

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