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Interactive Education with Exploration Virtual Reality Technology



Abstract: - Nowadays, technology plays a fundamental role in the development of daily life activities. In this regard, there is an increase in disciplines that have used technologies, with educational fields standing out above all. Within education, there are a series of emerging technologies that are increasingly implemented in the classroom. The use of virtual reality in education is a good way to attract them in learning. Using virtual reality in learning give positive impact to the trend of increasing motivation, more attracting and fast learning. This is to design the 3-dimensional environment for education. The usefulness of this research is Interactive Virtual reality game is new technology in education, inspire players to focus, feel interesting, and enjoy playing the game. Helpful in motivating students due to having an interactive, interesting, fantasy-occupied and challenging game. The students could improve their learning as they are well immersed in the game. Using 3-dimensional virtual reality game acts as a new way to improve a student's skill in learning. The virtual reality environment will give the students a new environment that they can feel real while wearing the Oculus and doing exercises. The virtual reality game design will be used at home.

Keywords: Digital Technology, Higher Education Learning, Virtual reality

I. INTRODUCTION

According to [1] computer science courses, particularly those that focus on programming languages and algorithms, are recognised for presenting substantial difficulties to students within this discipline. Presently, the predominant focus in conventional educational environments is on preparing for assessments, engaging passively in lectures instruction, and attempting to mentally grasp historical content sourced from textbooks. According to [2] the emphasis on formality, theory, and reliance on books in these learning approaches may deplete students' ability to maintain attention and concentration. An additional factor contributing to the challenges encountered in the process of learning is to the implementation of theoretical concepts in practical settings, as observed in both classroom and laboratory sessions [3]. The use of virtual reality has surfaced as a potentially advantageous educational instrument, augmenting the interest and involvement of students across a range of academic disciplines [4]. Virtual reality is a technological innovation that enables the digital representation of tangible items found in the physical world [5]. The process entails the use of computer modelling and immersive three-dimensional technology to generate a visual and sensory environment in three dimensions, facilitating user interaction [6]–[8]. Virtual reality applications utilise interactive devices such as goggles, headsets, gloves, or body suits to facilitate the transmission and reception of data, thereby immersing users in computer-generated environments that closely resemble reality [9], [10].

II. THE TECHNOLOGY OF VIRTUAL REALITY AND EDUCATION

According to [11] virtual reality education is seen as a safer, more cost-effective, and efficient alternative to traditional education, primarily due to its ability to significantly reduce training periods. The utilisation of virtual reality possesses the capacity to augment classroom experiences and broaden learning possibilities across all educational levels. According to [12], utilisation of virtual reality within educational environments possesses the capacity to function as a valuable instrument for growing student motivation and active participation in the educational journey. Government support, which includes funding for research, talent development, the creation of creative content, and responsible use, could further maximise the potential of immersive technology [13], [14].

The field of educational and training activities acknowledges virtual reality as a technology with significant potential and quick progress [15]. The implementation of this technology has resulted in favourable outcomes, such as heightened levels of participation, enhanced motivation, and improved learning efficiency. According to [16] touch screens and laptops are frequently used media platforms by students, while the accessibility of virtual reality devices is on the rise.

Virtual reality (VR) settings provide the potential to enable students to engage in the investigation of fictitious scenarios, so stimulating their imaginative faculties and fostering the cultivation of creative thinking skills. One of the key benefits associated with the integration of virtual reality technology in educational environments is the augmentation of the learning process, leading to heightened levels of engagement and interest among learners

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[17]. Virtual reality is used as a means for improving the educational experience of undergraduate students in the field of computer science, with a particular focus on enhancing their proficiency in Python programming. The primary aim of this initiative is to enhance and supplement conventional pedagogical approaches, including in-person lectures and practical laboratory activities. By employing a dynamic and participatory game-based methodology, students have the opportunity to acquire proficiency in Python programming, while potentially augmenting the entire educational milieu. The ongoing advancement of the project will generate significant interest in its efficacy [1].

III. EXISTING VIRTUAL REALITY GAME IN EDUCATION

In contemporary times, there has been an increasing inclination towards investigating benefit of using three-dimensional technology for delivering beneficial educational interventions in the realm of computer sciences [18], [19]. The integration of virtual reality technology in educational environments presents educators with the potential to include game-based instructional approaches, such as engaging design, which is gamification, and serious games, resulting in an enriched experience for students [20]. Furthermore, scholarly investigations have demonstrated that pupils using a virtual reality game-based programme exhibited enhanced cognitive benefits and had more positive dispositions toward the acquisition of knowledge [18].

The present study investigates the possible application of virtual reality Escape Rooms as a pedagogical tool in the field of biology education. Specifically, it aims to compare the effectiveness of Virtual Environment Escape Rooms with instructional films that incorporate narrative aspects. The research comprised a sample of 50 students enrolled in upper-secondary education, namely from the applied science track. According to a study conducted by [20], the utilisation of virtual reality Escape Rooms as a form of active learning resulted in superior short-term information acquisition when compared to the passive learning approach of utilising movies.

This brief analysis investigates virtual reality technology on its utilisation in surgical education. The utilisation of virtual reality technology presents an advantageous and economically viable approach to imparting surgical expertise and investigating surgical methodologies. The present study centres on the development of three-dimensional simulations of organs within the body and surgical paths through the utilisation of virtual reality technology. The text finishes by suggesting the creation of a full ecosystem to facilitate the implementation of surgical training using virtual reality technology [21].

A study was undertaken to examine the impact of three-dimensional learning on academic achievement in mathematics. The study employed a quasi-experimental methodology, wherein a treatment group consisting of 32 students utilised a virtual reality game, while a comparison group of 32 students employed conventional techniques, including the usage of mobile apps for fractions. According to the findings of [22], The utilisation of virtual reality gaming has been linked to improved academic performance and sustained student engagement in the realm of mathematics.

A formative assessment was done to examine the influence of a virtual reality expedition application on the computational thinking skills of higher education students. A total of six individuals were recruited using a random sampling technique, and a mixed research methodology was utilised in the study. The findings of the qualitative analysis indicated that the participants perceived the virtual reality mini-games as highly interactive and engaging, resulting in a notable improvement in their computational intellectual skills. Research has indicated that the incorporation of a cohesive gameplay experience within educational environments has been shown to augment students' aptitude for computational thinking. Furthermore, the integration of virtual reality explorations has been observed to cultivate curiosity and facilitate long-term knowledge retention among students. In a study conducted by [18], [19], was observed that users had a significant increase in information acquisition and perceived the mini-games as being conducive to educational purposes.

IV. GAME-BASED LEARNING WITH TEACHER SCAFFOLDING

Scaffolding has a key function in aiding the educational process of students. From opinion of [23], as learners gain greater independence, the level of help offered through scaffolding is steadily diminished. Scaffolding is an instructional method that has significant value and may be effectively implemented in diverse educational environments, including those that incorporate game-based learning. According to [24], the provision of assistance aids learners in achieving enhanced learning outcomes and fostering a happy learning experience.

The incorporation of teacher scaffolding in the field of game-based learning is a crucial interactive process that aims to enhance student learning outcomes. The utilisation of adaptive assistance within educational settings has been shown to have several positive effects. Firstly, it enhances students' enthusiasm and engagement, leading to increased levels of active participation. Moreover, it serves to enhance the comprehension of intricate subjects and promotes a more profound grasp of the educational goals. Visual aids are commonly used as scaffolding

techniques in game. According to [25] active engagement is fostered and students are able to establish connections between the game and real-life applications, resulting in enhanced learning outcomes.

Furthermore, in the realm of education, scaffolding is distinguished by three fundamental characteristics: contingency, fading, and a transfer of responsibility. Contingency is engagement provided to learners dependent on their level of competence. This adjustment is commonly implemented in educational games through the incorporation of adaptivity. The process of fading entails a progressive reduction of help provided to learners as they demonstrate increased competence. Ultimately, there is a transition in which learners progress from relying on external assistance to engaging in self-directed learning. The aforementioned attributes have a vital role in facilitating successful learning, especially within the context of game-based educational environments [26].

V. DESIGNING EDUCATION GAME

The development of an educational virtual reality game encompasses three fundamental elements: a conceptual framework, and a storyboard,

- A. Conceptual framework
- B. Storyboard

A. Conceptual framework

The research's conceptual framework encompasses various essential elements, such as the educational prerequisites of higher education, the elements of gaming, components of virtual reality, pedagogical principles in education, and the selected learning model. The framework presented in this study has been constructed by integrating existing literature and incorporating insights obtained from the current research.

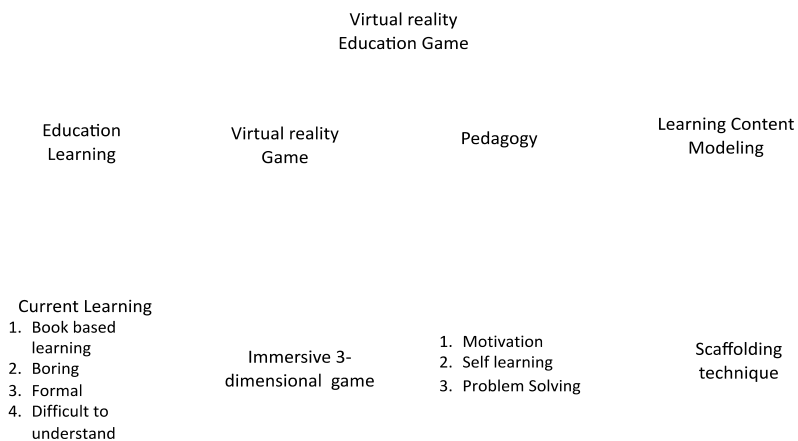


Fig.1 Conceptual framework

B. Storyboard

The process of developing a storyboard is based on the underlying conceptual framework, with a particular focus on integrating the curriculum and pedagogical principles by employing the scaffolding technique. The following is a depiction of the storyboard, delineating the framework of the virtual reality educational game, encompassing a Home page, three levels of educational gameplay, and a scoring page.

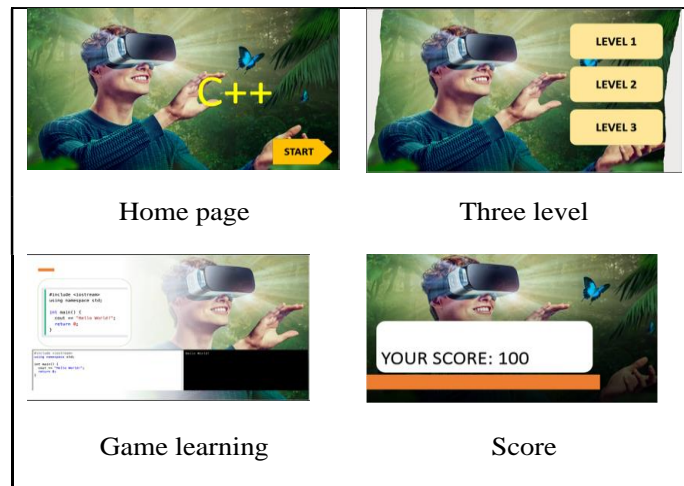


Fig. 2 Storyboard

VI. EVALUATION

This preliminary study aims to evaluate the efficacy of VR technology for education compared to conventional classroom education. There are six participants, three male, and three female, taking part. Data collection is based on the perception survey, and Correlation Coefficient between virtual reality and conventional learning. Here is the conclusion.

A. Result from perception survey

B. Correlation coefficient between virtual reality and conventional learning.

A. Result from perception survey

Table 1 Result from perception survey

Feedback	Strongly agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly disagree (%)	Average
1. The exercise that are mediated by technology are a good way to structure my learning and speaking process.	3 (50%)	3 (50%)	0	0	0	2.5
2. The technology-mediated exercises improve communication between the instructor and the students.	5 (83.33%)	1 (16.67%)	0	0	0	3.6
3. The technology-mediated exercises are an effective method for teaching.	2 (33.33%)	4 (66.67%)	0	0	0	2.7
4. The activity, which are mediated by technology, offer a multifaceted view of learning.	0	6 (100%)	0	0	0	5
5. The activities made possible by technology will aid my studying in next classes.	4 (66.67%)	2 (33.33%)	0	0	0	2.7
6. The technology-mediated exercises are a good way to assess my performance and that of my cohorts.	0	2 (33.33%)	4 (66.67%)	0	0	2.7
7. The technology-mediated activities offer a multifaceted viewpoint on evaluation.	1 (16.67%)	3 (50%)	2 (33.33%)	0	0	1.9

Fig. 3 below shows 50% strongly agree and 50% agree that virtual reality technology is a good way to learn and speaking process.

The exercises that are mediated by technology are a good way to structure my learning and speaking process

6 responses

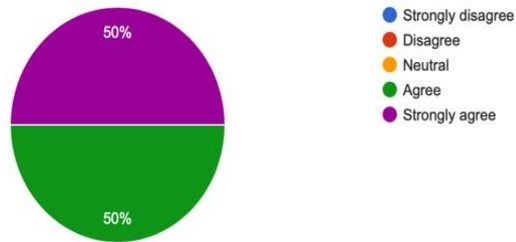


Fig. 3 Technology as a way of learning and speaking process

Fig.4 below shows 83.3% strongly agree that communication is approved using technology of virtual reality in learning. 16.7% agree with this statement.

The technology-mediated exercises improve communication between the instructor and the students.

6 responses

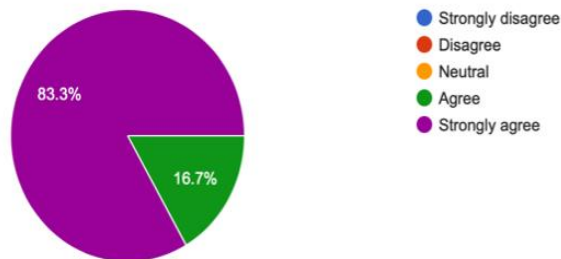


Fig. 4 Technology can improve communication

Fig. 5 below shows a positive result which is 66.7% agree that technology exercise is effective in education. Other than that, 33.3% strongly agree with this method used in learning.

The technology-mediated exercises are an effective method for teaching.

6 responses

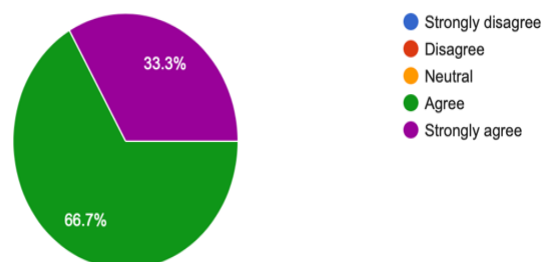


Fig.5 Technology as a method of learning

Fig. 6 below shows all students agree that activities offer multifaceted view of learning.

The activities, which are mediated by technology, offer a multifaceted view of learning.

6 responses

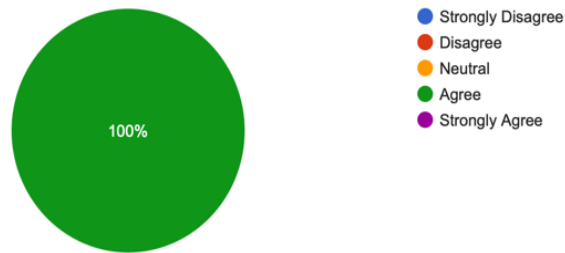


Fig.6 Technology can multifaceted view in learning

In Fig.7, all students give positive feedback about technology aid studying in the next class

The activities made possible by technology will aid my studying in next classes.

6 responses

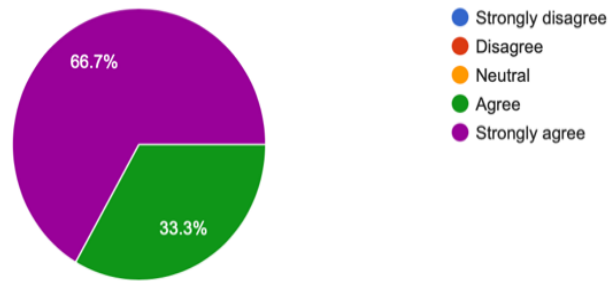


Fig.7 Technology aid studying in the next class

Fig. 8 below shows most of the students vote for neutral to the technology exercise is a good way to assess their performances.

The technology-mediated exercises are a good way to assess my performance and that of my cohorts.

6 responses

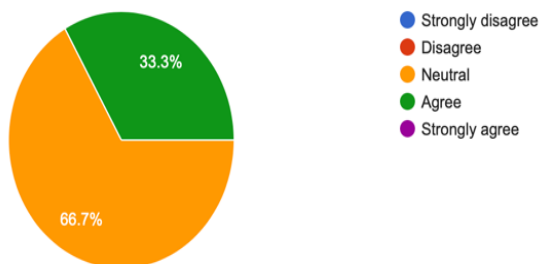


Fig.8 Technology as a way to assess performance

In overall, Fig.9 based on perception survey using the questionnaire, shows that 82% strongly agree, 13 % agree, 7% are neutral, based on education used the Scaffolding learning model.

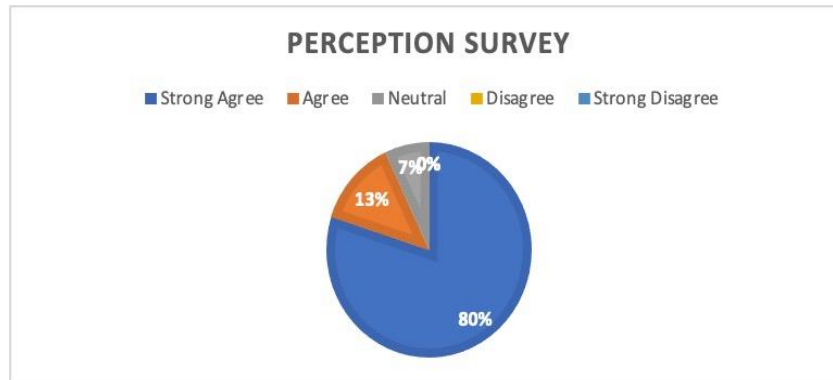


Fig.9 Perception Survey

B. *he correlation coefficient between virtual reality and conventional learning.*

Figure 13 shows the differences between virtual reality technology and conventional learning based on student preference with the Scaffolding learning model. From the figure, it shows that learning using virtual reality give higher value coefficient compared to conventional learning.

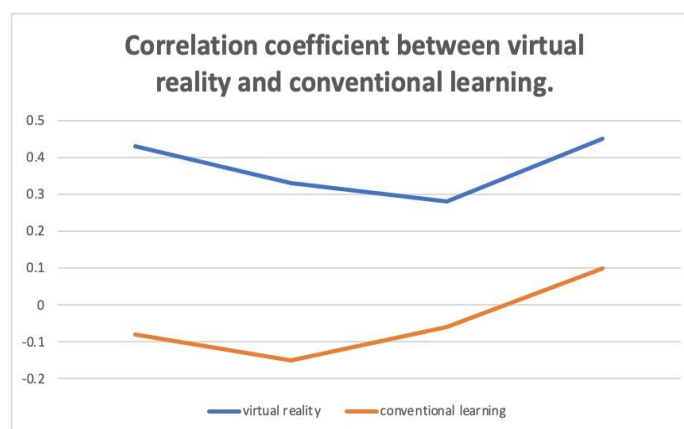


Figure 13 Correlation coefficient between virtual reality and conventional learning.

SIGNIFICANT

Virtual reality game is a new technology in education. The element of the game, the game genre, the type of game is important to inspire players to focus, feel interesting, and enjoy playing the game. Game level, which is the challenge between level, is important in the development of the game to measure that it is not too easy to make it boring and not too difficult to frustrate. Designing a 3-dimensional environment in the virtual reality game helps players get involved in the game. Virtual reality game in education is helpful in motivating students due to having an interactive, interesting, fantasy-occupied and challenging game. Besides, the students could improve their learning as they are well immersed in the game. Using 3-dimensional virtual reality game acts as a new way to improve a student's skill in learning. The virtual reality environment will give the students a new environment that they can feel real while wearing the Oculus and doing exercises. In addition, the virtual reality game design will be used at home.

CONCLUSION

The research contribution is to use the scaffolding learning style model by integrating virtual reality technology to make it multimodal. This approach combines multiple sensory experiences to improve the comprehension of any subject matter. By utilizing an interactive virtual reality environment, this strategy is feasible and can be implemented not only in higher education institutions but also at all educational levels. The core idea behind this approach is that combining various learning modalities improves students' ability to retain information as the VARK model engages the brain through multiple learning styles at once.

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