EEEE

Comparison of Different Student Categories using Augmented Reality and Conventional Methods

Norfatanah Sirat[1], Maisara Othman[1]*, A.A. Ayub[1]

[1]Department of Electronic Engineering, Faculty of Electrical and Electronic Engineering,
Universiti Tun Hussein Onn Malaysia, Batu Pahat, 86400, MALAYSIA

*Corresponding Author Designation

Abstract: This paper is about introduction to augmented reality (AR) technology for educational purposes whose aim is to provide a module education for students. AR can be defined as an interactive 3D environment which links physical reality and virtual reality. This technology is widely used in education that can help the students quickly acquire, process, and remember the information. The method that is usually used is unattractive and less efficient to gain knowledge among the students. This problem occurs due to lack of interactive platforms in which most of the generation kids are addicted to their smartphone. The main objective for this project is to design VKV and KVKK modules using augmented reality applications. Method to create the AR education platform was not that difficult with the help of many open source platforms such as Unity Real-Time Development Platform or known as Unity 3D, blender, Vuforia and etc. The new AR application called ReModAR has successfully developed for Android OS and been tested to four students with different education backgrounds and categories. Based on the results, Alicia was able to gain a higher percentage difference and recorded a faster answering time when using the AR application method for both modules. Even though Amsyar gained the lowest percentage difference, he showed good improvement in result time taken between conventional and application methods by 50% for KVKK and 66% for VKV module. From this augmented reality applications, it provides a significant impact on students in terms of quick learning understanding and it helps the students to answer and memorize the words easily than using conventional method. The students also gave a positive response while learning and playing with this interactive app. We hope by built this application it helps the students to enjoy the learning process in a fun way.

Keywords: Augmented Reality, Conventional Methods, VKV Module, KVKK Module

1. Introduction

Reading and writing are extremely difficult tasks. According to the Ministry of Education, these kids are individuals who have difficulty reading, writing, and calculating as a result of environmental

problems rather than cognitive ability. The reading comprehension problems occur when the child has difficulty understanding the meaning of words and the relationship between letters and sounds.

Besides that, teachers at kindergarten and primary school (level 1) usually use conventional books or flash based for e-learning. However, this method is lack of interactive elements to stimulate the children's psychomotor.

Previous research proves that the "Development system of students' spatial ability thinking (Exercise Book)" shows the result of a pilot study designed to evaluate the effect of attending an intensive remedial course based on AR to improve the spatial ability of engineering students [1]. Then, next paper is about "English Alphabet to Kindergarten Children" by Safar, Al-Jafar and Al-Yousefi evaluate the effectiveness of Augmented Reality in Teaching the English Alphabet to Kindergarten Children and this paper compares two types of teaching methods which are; the first one is taught using AR apps, and the second one uses traditional face-to-face methods [2]. The third paper is about "Learning mathematics subject and visual thinking among students" by Aldalah, Ababneh, Bawaneh and Alzubi come out with an AR system that used to investigate the effect of the augmented reality and simulation on the achievement of mathematics and visual thinking among students [3]. Next, the fourth research paper is an augmented reality storybook (AR Baca-Pulih) that gives motivation, engagement, and a fun experience, as well as an AR flashcards design based on whole language and related to remedial students' environment [4]. The writers Juan, Beatrice, and Cano come out with an AR system for learning the interior of the human body that was carried out in the learning of the human digestive system on the AR education system [5]. Last but not least, the last research paper is about "AR Toolkit to help teach undergraduate geography students about earth-sun relationships" [6].

This project aims to design the augmented reality applications that focus on vocal consonant vocal (VKV) and consonant vocal consonant consonant (KVKK). We have successfully built an education module using Blender, Unity3D and Vuforia Software Development Kit (SDK) that called ReModAR apps. This ReModAR apps is used to help the students to learn how to pronounce alphabet phonic sound and syllable in student's education. We also have analyzed the effectiveness of these two modules for four different students. There are three different categories which are kindergarten, primary student without learning disabilities and with learning disabilities. We have made the comparison analysis to these three different categories by using conventional method and AR. The comparison results show that there is a significant improvement of time taken to answer all the quizzes when using the AR. We believe that, this ReModAR apps give a positive impact to the students and they really enjoy learning these VKV and KVKK modules.

2. Methodology

In this project, our focus is to help the students to learn how to pronounce alphabet phonic sound and syllables. We built 2 modules out of 32 modules which are VKV *(Kemahiran 6)* and KVKK *(Kemahiran 16).* The software that has been used are Unity 3D and Vuforia to create the ReModAR apps.

2.1 Block Diagram

Figure 1 shows a block diagram of augmented reality (AR) process for these android apps on a smartphone. There are four components involved which are camera, processor unit, database and screen. All these components are the basic requirement for the AR program.
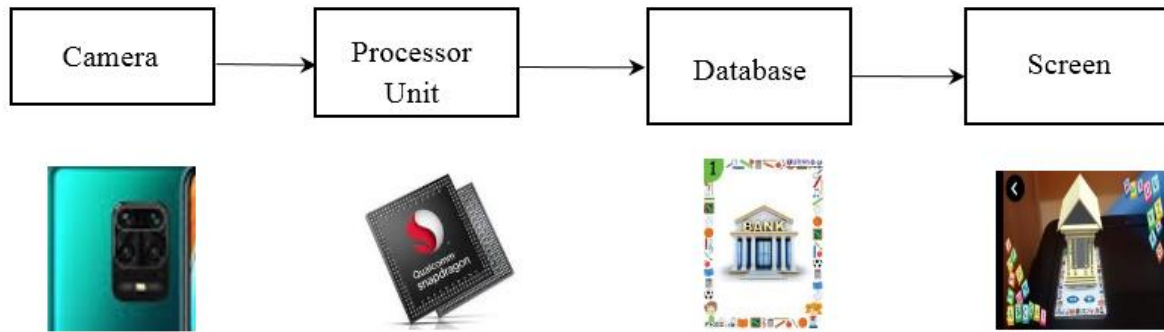
Figure 1: Block diagram for the AR process in smartphone

2.2 Application Development

Augmented Reality (AR) is a real-time direct or indirect view of a physical real-world environment enhanced by the addition of virtual computer-generated data. Then AR is a technology that's both interactive and 3D-registered, and it blends actual and virtual items. This project are focusing on two modules which are VKV and KVKK that are required to used Vuforia package to create the image target, blender software for implementing 3D objects. Figure 2 below shows the flowchart of the development process of ReModAR applications from software installation, the process of building the modules until the apps are successfully developed and can be used on the android smartphones.
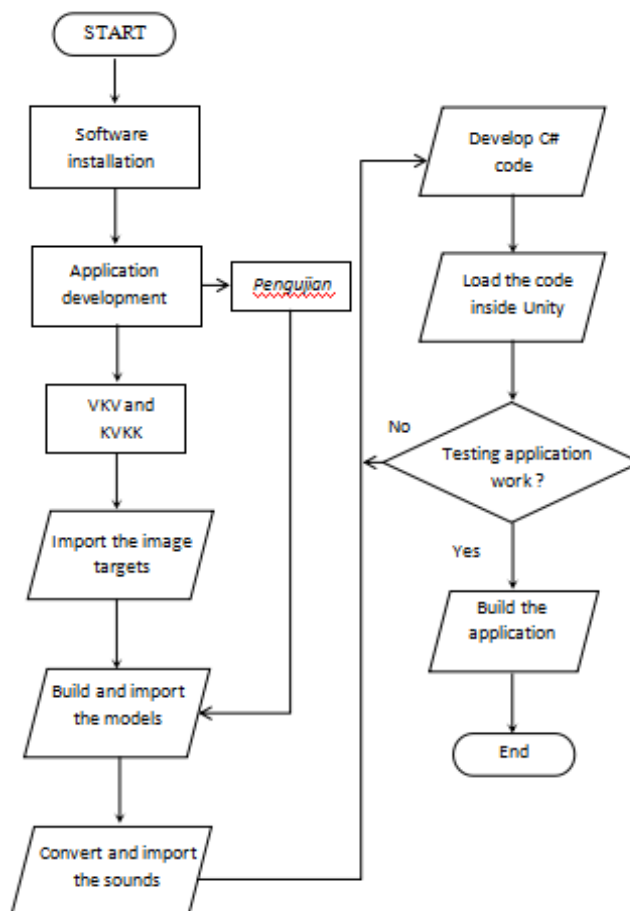

Figure 2: Development process of remedial module using augmented reality applications

3. Results and Discussion

This project has been successfully developed and it has been tested on four different students. Firstly, four students need to be taught how to read,spell and correct word pronunciation for the both modules. After students familiar with these modules they have been exposed to ReModAR apps. Then, the students play and learn the VKV and KVKK *(Pembelajaran)* to ensure they are familiar with all the VKV and KVKK words. The student's performance has been evaluated based on the time taken to finish up each question. Every one of them was tested with a timer that has been set in the *Kuiz* menu and the results have been recorded based on the time taken for each question. To make the comparison reliable, we need to set the same quizzes as in the *Kuiz* menu for the conventional method.

To see the difference, Eq. 1 has been used to calculate each student's average percentage difference in reduction time taken based on Table 1. The result shows the comparison between the testing that has been done using the conventional method and AR apps. Overall, the AR method showed that there is reduction in time taken to complete all the quizzes. The two modules have been tested into three types of different categories which are kindergarten students, primary school with and without learning disabilities students. These results have been plotted in Figure 3 and Figure 4 to see the trend for the four students for VKV and KVKK modules. For KVKK module, Farhah, Rafiq, Alicia and Amsyar were able to score more than 50% (time taken) and recorded a faster answering time when using the application method rather than conventional method. Even though Amsyar was a remedial student and he scored the lowest percentage time difference, it showed that he has a great improvement when using the AR apps compared to the conventional method. Overall these analysis shows that this app can help the students to improve their learning time and also suitable for kindergarten, and early primary students with or without learning disabilities.

$$\frac{Conventional - Application}{Conventional} \; x \; 100\% \qquad Eq.1$$

Table 1: Comparison results between conventional method and application method

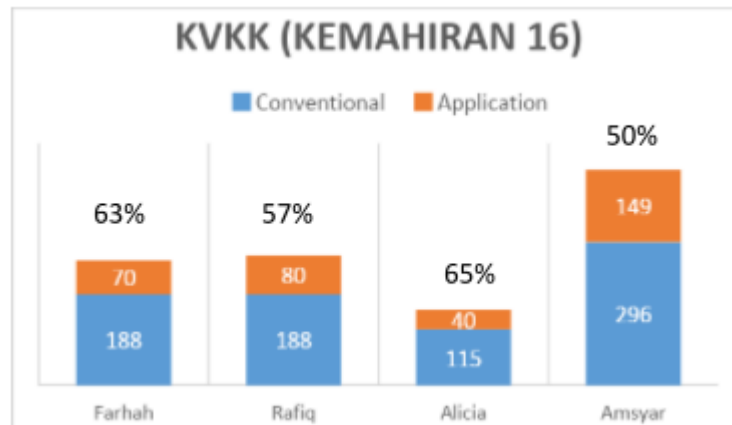| Student Category	Students Name	Module	Conventional (Second)	Application (Second)	Difference %
Kindergarten	Farhah	KVKK	188	70	63
		VKV	180	40	78
Without Learning Disabilities	Rafiq	KVKK	188	80	57
		VKV	176	54	69
	Alicia	KVKK	115	40	65
		VKV	136	31	77
With Learning Disabilities	Amsyar	KVKK	296	149	50
		VKV	241	83	66

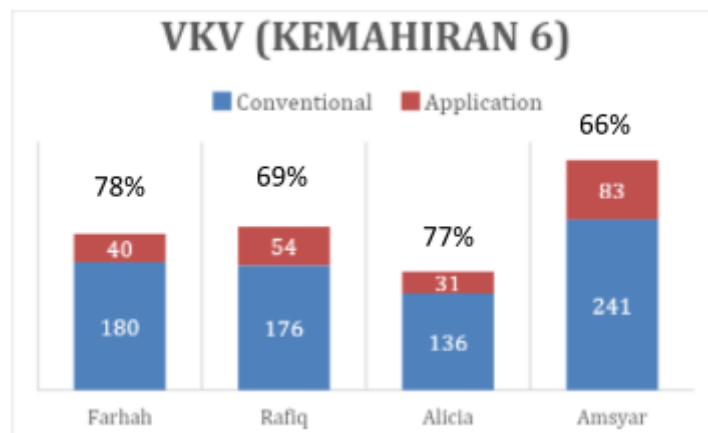**Figure 3: Statistics analysis of four students (KVKK-** *Kemahiran 16*)

Figure 4: Statistics analysis of four students (VKV- *Kemahiran 6*)

Figure 4 shows the trend for VKV module, all of the students score above that 50% (time taken) recorded on answering VKV module when using ReModAR apps. The highest is 78% and the lowest is 66% of average percentage time difference. This application provides a significant impact on students in terms of quick learning understanding and with the help of the sound as hints in the kuiz scene, students are able to answer and memorize the words more easily than using conventional method. The students also gave a positive response while learning and playing with this interactive app.

4. Conclusion

This ReModAR apps have been successfully developed by helping the students to improve their performance in term of time taken in answering the quizzes when using ReModAR apps. This apps are able to generate the 3D models, sounds according to the image target that has been set in Vuforia software and being exported in unity 3D. Furthermore, the quiz part has been built in this apps which it used to measure the understanding of remedial students towards VKV and KVKK learning, and to analyze the effectiveness of this apps for the students. This ReModAR apps can only be installed in android smartphones and other OS operated applications cannot be used in this apps. Then, this app can only use single images as a target. Last but not least, this ReModAR apps give a positive impact to all the students and they really enjoy learning VKV and KVKK modules. From this feedback, it showed that ReModAR apps can replace book cards and reduce the use of paper.

Acknowledgement

The authors would like to thank the Faculty of Electrical and Electronic Engineering, Universiti Tun Hussein Onn Malaysia for its support.

References

[1]   Contero, M., Gomis, J., Naya, F. and Albert, F., 2020. Development of an Augmented Reality Based Remedial Course to Improve the Spatial Ability of   Engineering Students

[2]   Safar, A., Al-Jafar, A. and Al-Yousefi, Z., 2016. The Effectiveness of Using Augmented Reality Apps in Teaching the English Alphabet to Kindergarten Children: A Case Study in the State of Kuwait. *EURASIA Journal of Mathematics, Science and Technology Education*, 13(2)

[3]   Aldalalah, O., Ababneh, Z., Bawaneh, A. and Alzubi, W., 2019. Effect of Augmented Reality and Simulation on the Achievement of Mathematics and   Visual   Thinking Among Students. *International Journal of Emerging Technologies in   Learning (iJET)*, 14(18), p.164

[4]   Abas, H. and Zaman, H., 2011. Visual Learning through Augmented Reality Storybook for Remedial Student. *Advanced Informatics School, Universiti   Teknologi Malaysia, 15400 Kuala Lumpur*,   [Accessed   27 December   2020]

[5]   Juan, C., F. Beatrice, and J. Cano. July, 2008. An Augmented Reality System   for Learning the Interior of the Human Body. *In, Eighth IEEE International Conference on Advanced Learning Technologies, 186-188. DOI   10.1109/ICALT.2008.121*

[6]   Billinghurst, M. 2002. Augmented Reality in Education. *Retrieved April,1,2009*