



Augmented Reality-Based Computer Hardware Assembly Simulation Learning Media Design at SMK N 1 Bukittinggi

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ABSTRACT

This research is based on the results of observations that the author did at SMK N 1 Bukittinggi. From the results of observations the authors know that in the subject of Basic Network Computers do not use learning media in the learning process. The learning process is carried out in the form of direct practice accompanied by an explanation from the subject teacher. This is seen as less effective in its implementation. Thus the purpose of this study is to design learning media for computer assembly using Augmented Reality technology in order to increase the effectiveness of the learning process. The research method used is the Research and Development (R&D) research method, which is a method used to produce products. The R&D model used is the 4D version, namely, define, design, develop, disseminate with the Luther Sutopo development model which consists of 6 stages, namely conceptualization (concept), design, material collection, manufacture (assembly), testing (testing), distribution (distribution).). And the product test consists of 3 tests, namely validity test, practicality test, and effectiveness test. Based on the results, the author succeeded in designing Augmented Reality-based assembly learning media. This learning media can be used by teachers and students in Basic Computer Networking subjects. The form of this learning media is an application (apk) that is run using Android, while the validity results obtained from 3 validators are 0.86 which is declared valid, the practical results obtained from 2 examiners are 85.33 which are declared practical, and effectiveness was obtained from 10 students 0.87 which was declared effective.

Keywords: *Augmented Reality, Design, Learning Media*

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INTRODUCTION

Learning is a process of changing one's personality and attitude, these changes include improving the quality of behavior, such as increasing knowledge, skills,

thinking power, understanding, attitudes, and various other abilities (Roy dkk., 2019). Learning is essentially a "change" that occurs in a person after doing learning activities.

The function of the Quran in life is as a book of guidance. In accordance with the affirmation of the Quran itself, namely guidance for humans, information about guidance and a separator between the right and the false (Lei dkk., 2020). Quraish Shihab said that discussing the relationship between the Quran and science is not judged by the number of branches of science that are embodied in it, nor by showing the truth of scientific theories (Boje dkk., 2020). But the discussion should be placed in a more appropriate proportion in accordance with the purity and sanctity of the Quran and in accordance with the logic of science itself.

Learning and learning have been running at the time of the Prophet Muhammad SAW, in other words that education has existed since the time of the Prophet Muhammad SAW. The educational process goes hand in hand with the Prophet's efforts to develop religion. Therefore, education is a basic need for every human being.

Especially in education, the Quran is the normative source. Based on this, it can be understood that learning and learning will be found from the Quran which deals with the instructions of the Quran about the importance of learning and learning. The command of learning and learning is stated in Q.S al-'Alaq/96: 1-5:

أَفْرَأْ بِأَسْمِ رَبِّكَ الَّذِي خَلَقَ ١ خَلَقَ الْإِنْسَانَ مِنْ عَلَقٍ ٢ أَفْرَأْ وَرَبُّكَ الْأَكْرَمُ ٣ الَّذِي عَلَّمَ بِالْقَلَمِ ٤ عَلَّمَ الْإِنْسَانَ مَا لَمْ يَعْلَمْ

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Meaning

(1) Read by (mentioning) the name of your Lord who created, (2) He has created man from a clot of blood, (3) Read, and your Lord is the most gracious, (4) Who teaches (man) by the medium of the word, (5) He taught man what he did not know (Qs. al-'Alaq / 96: 1-5)

In Surah Al-'Alaq verses 1-5 Allah SWT provides a basic description of the educational values of reading, writing, researching, studying, analyzing something that is not yet known, and these works must always begin with the name of God (bismillah). Kalam Allah SWT above, we are encouraged by Allah SWT to pursue knowledge. As for the manners in demanding knowledge, one of them is with the intention of Lillahi Ta'ala (because of Allah SWT) (Tjoa & Guan, 2021). We always start by mentioning the name of Allah SWT which means reciting Basmalah before studying. And we must also glorify existing media or learning resources, including books, al-Qur'an, books of interpretation, and so on by reciting Basmalah also before opening or studying them.

Education is a deliberate effort to mature young people into responsible human beings and have certain abilities as a successor to culture (Bao dkk., 2019). This is contained in the National Education System Law article 1 which reads "Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-

control, personality, intelligence, noble character, and skills needed by themselves, society, nation and state."

The learning process in Indonesia is regulated in the 1945 Constitution Article 31 on the national education system, which in paragraph 3 states that "The government seeks and organizes a national education system, which increases faith and piety and noble character in order to educate the nation's life which is regulated by law" (Balia dkk., 2021). Paragraph 5 also states that "The government promotes science and technology by supporting religious values and national unity for the advancement of civilization and the welfare of mankind."

In Law No.20 of 2003 on the National Education System, it is stated that (Zhang dkk., 2020):" Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation and state " (Lu dkk., 2020). Education is a process where humans foster the development of other humans consciously and systematically (Qi dkk., 2019). With this guidance, the coach helps and is fostered to be able to complete his life on his own responsibility.

Mr. Ki Hajar Dewantara explained his understanding of education as "guiding all the forces of nature that exist in children, so that they as human beings and as members of society can achieve the highest safety and happiness." In short, education for Mr. Ki Hajar Dewantara means an effort to advance the development of character (inner strength), mind (intellectual), and body of learners."

Humans today are very dependent on technology. This makes technology a basic need for everyone. From old people to young people, experts to ordinary people also use technology in various aspects of their lives (Zamora-Izquierdo dkk., 2019). Today's technology has developed rapidly. Unlike in the past, technology is very influential in aspects of human life and plays a role in the lives of the wider community, including in the field of education (Lei dkk., 2020). In education itself, technology now has its own role in the teaching and learning process, one of which is the use of computer-based learning media.

Media comes from Latin which is the plural form of "Medium" which literally means "Intermediary" or "Introduction", namely the intermediary or introducer of the message source with the message receiver (Messina dkk., 2021). Gagne states "Media are various types of components in the student environment that can stimulate learning." While Briggs states "Media is any physical tool that can present messages and stimulate students to learn" [9].

The development of educational media in accordance with the changing times that are increasingly advanced and modern, should also be followed by the procurement and discovery of educational media that are more modern and can be applied to education today (S. Wang dkk., 2020). So that the teaching and learning process (PBM) in the classroom is more effective and efficient (Gibb dkk., 2019). At this time has developed educational media based on technology such as, tutorial learning media, presentation

media with the help of Power Point applications and the like, even media based on Virtual Reality and Augmented Reality technology.

Augmented Reality (AR) technology is a technology that allows the addition of synthetic images into the real environment. Unlike Virtual Reality (VR) technology which fully invites users into a synthetic environment, Augmented Reality (AR) allows users to see 3-dimensional virtual objects added to the real environment. [10]

By utilizing Augmented Reality (AR) technology (Al-Fraihat dkk., 2020a), this props can be replaced with a 3-dimensional props model that is displayed virtually using a computer device, so that students can learn it easily and for schools can save expenses because they no longer need to buy props. Students can find out how virtual technology can be used in education (Al-Fraihat dkk., 2020b). In addition, with the use of Augmented Reality (AR) technology to students, it is hoped that it can add students' insight into the direction of current technological developments.

The author has conducted observations and interviews on September 4, 2019 at SMKN 1 Bukittinggi (Giudicessi dkk., 2020). The results of the observations that the authors get are, in the learning process of assembling computer devices, paracticum activities are carried out in the computer labor using computer devices provided by the school. Teachers teach and explain to students with direct practice. Students are formed in several groups to carry out practicum activities and work together in assembling computer hardware (Verdoliva, 2020). During the practicum activities there are obstacles and problems that arise such as, the facilities used are inadequate and not enough for each student so they have to take turns in practice, the components used are not new model components and still use old model components.

The author also conducted an interview on September 4, 2019 with the Head of the Computer Network Engineering Department (TKJ) of SMKN 1 Bukittinggi, namely Mr. Amnur, S.T. From the results of the interview the author found out that many facilities and infrastructure for assembling computer hardware were lost, damaged and not suitable for use. Furthermore, the author interviewed the teaching teacher (Naparstek & Cohen, 2019), Mr. Beni Astaro S.Pd., M.Kom on September 4, 2020, who stated several things, namely the learning strategies used were Scientific learning or student-centered, so that the teaching and learning process is more burdensome for students to ask more questions and be more active in learning and exploring knowledge independently (Alamoodi dkk., 2021). In the learning process, students ask a lot of questions and ask for direction on problems that arise. The media used are slides, reference books, tourorial learning media and the internet (M. Wang & Deng, 2021). The use of tourorial media in the form of 3-dimensional media is still not used in learning. Mr. Beni stated that direct practice activities are more supportive of student understanding in assembling computer hardware.

Furthermore, on June 23, 202 interviews with 3 students at SMKN 1 Bukittinggi (Lyu dkk., 2019). From the results of the interview the author found out that because the assembly was carried out in groups, it caused some students who did not get the opportunity to do the practical activities (Nurazizah dkk., 2023), this caused many

students who did not understand the material of the practical activities. In addition, the students interviewed also hoped that there was media that could be used for independent learning or for practice at home (Guerrini-Rousseau dkk., 2019). The reason is that students do not have computer devices that can be used for practice at home, even though there are students who do not dare to disassemble computer devices and assemble them again.

Based on the description above, learning media that can simulate the computer assembly process is needed (Jarvis dkk., 2019). The position of the media to be designed is as a learning media used to repeat the subject matter outside of learning hours (Chen dkk., 2021). This simulation learning media is made using Unity Software using Android-based Augmented Reality (AR) technology. By using Augmented Reality (AR) technology, students can carry out assembly without the need for real computer devices.

Noting the explanation above, the authors raised research with the title: "Design of Learning Media Simulation of Augmented Reality-Based Computer Hardware Assembly at Smkn 1 Bukittinggi".

RESEARCH METHODOLOGY

The type of research used is research and development (R&D). R&D research or research and development is a research method used to produce certain products, and test the effectiveness of these products[32].

This type of development research can be used for various forms of product development such as models, learning methods, learning strategies, media and teaching materials. The research step that the author uses is the 4D version developed by Thiagarajan et al, which is called the 4D Model because the development model has four stages, namely the abbreviation of Define, Design, Develop, and Disseminate [33].

The author's reason for choosing 4D is based on systematic and theoretically grounded considerations of a system. This model is structured programmatically with a sequence of activities carried out systematically in an effort to solve problems. Also, this 4D model does not include implementation and evaluation because according to their rational considerations, the development process always includes product manufacturing activities (implementation), and evaluation. Furthermore, the development research in this 4D version will be described sequentially and systematically in the explanation of the stages as follows.

RESULT AND DISCUSSION

This research has produced a research product in the form of an android application (apk) learning Augmented Reality-based computer hardware assembly simulation. For interface design using SketchUp, Unity 3D and Corel software.

This media is made as a supporting material for the TKJ learning process at SMKN 1 Bukittinggi odd semester. It is hoped that with this media, students'

understanding, enthusiasm and interest in the material presented will increase even more. This Learning Media is presented in 8 main menus, namely instructions for using the media, competencies, material explanations, exercises, AR models, simulations, about the app and researcher profiles.

In this learning media there is material about Basic Network Computers. In addition, there is also a marker book that can be scanned using an AR camera scan to see the results of 3D objects on Basic Network Computer material.

The results of this study are supported by questionnaires that researchers have made and distributed to get the results of validity, practicality and effectiveness of learning media Augmented Reality-based computer hardware assembly simulation of Basic Network Computers. Can be seen in the appendix of this researcher's thesis.

CONCLUSION

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