DEVELOPMENT OF LOGIC GATEWAY AND NETWORK LEARNING APPLICATIONS USING AUGMENTED REALITY FOR COMPUTER ARCHITECTURE ADDIE METHOD CURRICULUM

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Abstract: As time goes by, technology develops more and more, one of them is mobile technology. On mobile technology in this era that is often used is the use of augmented reality technology. The following research aims to provide an overview of several steps involved in the creation of an Android learning media application based on augmented reality material gateway and set of computer system logic lessons for computer architecture courses. In this kind of research, it's application development. The process on the development of this application applies ADDIE method that is structured over five stages, namely Analysis, Design, Development, Implementation and Evaluation. From this study obtained an average score of validity of the Android mobile learning application using augmented reality gate and set of logic courses computer architecture is 4,54 and included in very valid section. Results showed that students responded positively to augmented reality-based mobile learning logic networks. Out of student responses, 80% responded in agreement with each part of the answer, and 85% of students obtained a score above the minimum accuracy criteria so that the use of the application Learning logical networking using augmented reality is in the category of effective.

INTRODUCTION

Learning is a collaboration between students, educators, and learning assets in a learning climate. Gagne (1977) identified learning as a series of external events intended to support internal learning. Furthermore, Gagne (1985) outlined his hypothesis by stating that in order for learning to be planned, external circumstances must be plane to enforce, support, and follow the inner cycle contained in each learning opportunity. The use of learning media in educational and educational experiences can also create new cravings and interests for learners, generate learning motivation as well, have a mental impact on learners (A. Azhar, 2013). In modern times, the presence of innovation has an enormous impact, the ability of innovation is to address the various

problems that exist. The increase in learning innovation in Indonesia is increasingly remarkable and expanding with the presence of PC-based learning media and Android phones. Furthermore, learning activities that take place when students use mobile technology devices are referred to as "learning media." (D. Nincarean, M. B. Alia, N. D. A. Halim, and M. H. A. Rahman, 2013). Augmented reality, which can display 3D objects on smartphones, is one of the latest technologies in learning media. This makes it an interesting, fun, and interactive alternative learning method, ultimately increasing the interest of learners. The more students own and use smartphone technology, the greater the chance of using technology devices in a learning process. The ability to show some things that cannot be observed directly by the student is one of the advantages of using it in the learning process (F. Ozdamli and D. Karagozlu, 2018). One of the other benefits of augmented reality is that it tends to be used to help imagine dynamic ideas for understanding and identifying an object (R. Azuma, M. Billinghurst, and G. Klinker, 2011). Unfortunately, not much research has been found in gates learning and logical networking that utilizes AR. Based on interviews with teachers, that students still have difficulty understanding the material of gates and logical chains. Results from the daily repetition of pupils showed almost 80 percent of the score below the criteria. Besides, teachers of such subjects tend to use direct teaching materials like textbooks, so it is highly likely that the teaching material is less interesting and has not used an augmented reality-based Android smartphone. Based on the previous explanation, the researchers will solve the problem by teaching logical networking materials using learning media using AR. The aim of this research is to describe the process of developing learning media using AR on class X logic network material and to produce augmented reality-based learning material on practical, effective and valid class X Logic Network material. "Design of Multimedia Applications for Learning Logic Gateways Using Augmented Reality," by Rosdelima H., is an example of a previous study relevant to this study (R. Hutahaean, R. R. Isnanto, and K. T. Martono, 2015). Other relevant research is from (Ikhsan Parinduri, Siti Nurhabibah Hutagalung, 2019) "Merangkai Logic Gateway using matlab (Simulink)". Other research included "Studying Molecular Bindings in Chemistry Lessons Using Augmented Reality" by (Honoris S, 2017). Other research such as a study by (Dian N., 2020) "Development of Augmented Reality as a Volcanic Disaster Education Media." In addition to other

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research, such as the study "Application of Augmented Reality Technology to Logic Gateway Learning in Computer System Learning" by Mochammad M. A., Hendrawan A., and Indra M. (M. M. Alamin, H. Armanto, and I. Maryati, 2020).

RESEARCH METHODS

This is a phase of the study that can be seen in Figure 1 below.

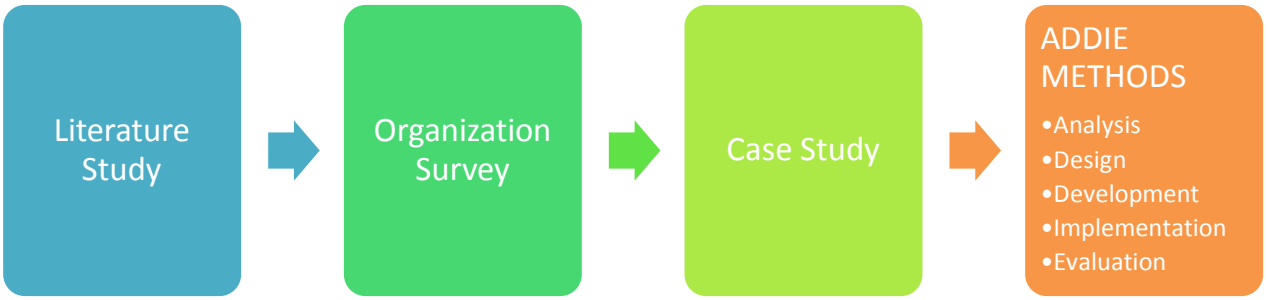

Figure 1. Research Phase

1. Analysis

   The initial stage carried out was research needs analysis, starting from data collection by looking for sources from previous research that were relevant and accurate. Then analyze the needs for creating a cinema application, this involves collecting information about user needs, the features the user wants, and the problems they want to solve. This will help in designing the objectives and scope of the application

2. Design

   After the analysis stage is carried out, the next stage is to design the cinema application system as a whole. This includes architectural design and user interface design. This design becomes the basis for further application development.

3. Development

   At this stage, what is made in the learning media utilizes AR using the details of the H110 M motherboard equipment, the AMD A8-6410 APU processor, 2.00 GHz graphics, 4GB RAM and research instruments in the form of anklets.

4. Implementation

In this section, the initial implementation of the introduction of a gateway learning application and a logical network utilizing AR to pupils and teachers, the level of media practicality is determined by a field test on learning in two classes during eight meetings, followed by an evaluation. Students were asked to fill in a questionnaire on their responses to learning using augmented reality (AR) media on the gateway material and the logical series after the material was delivered. Evaluation tests and improved learning outcomes of students after using media showed media effectiveness.

5.Evaluation

After testing, evaluation of the effectiveness and practicality of the media is carried out at this stage. The information obtained using the instrument created is also checked quantitatively, namely as follows:

a. Analysis of valid data One expert in material and one expert in media receives a validation sheet, on each validating sheet for media and material. Validation scores are usually described as follows: 1. 1,00 to 1,50 categories invalid 2. 1.51 to 2.50 categories invalid 3.2.51 to 3.50 categories quite valid 4. 3.51 to 4.50 category valid 5. 4,51 to 5,00 category very valid Applications learning gates and logic series using AR are said to be valid if at any category the minimum is included in a valid category.
b. Analysis of practicality data the student's response is considered positive if, for each aspect they respond to, at least 80% of the student responds positively.
c. Effectiveness data analysis

1.Calculate the learning outcome of each student, with the following formula.

$$\textbf{\textit{Learning Results}} = \frac{\textbf{\textit{Total Score Correct}}}{\textbf{\textit{Total Maximum Score}}} \quad (1)$$

RESULTS AND DISCUSSION

1. Design Stage

Create plans on learning media using AR, such as guidelines for use, student activity sheets and marker cards used as learning materials with augmented reality. For augmented reality-based learning materials, here are some models of marker card pictures.

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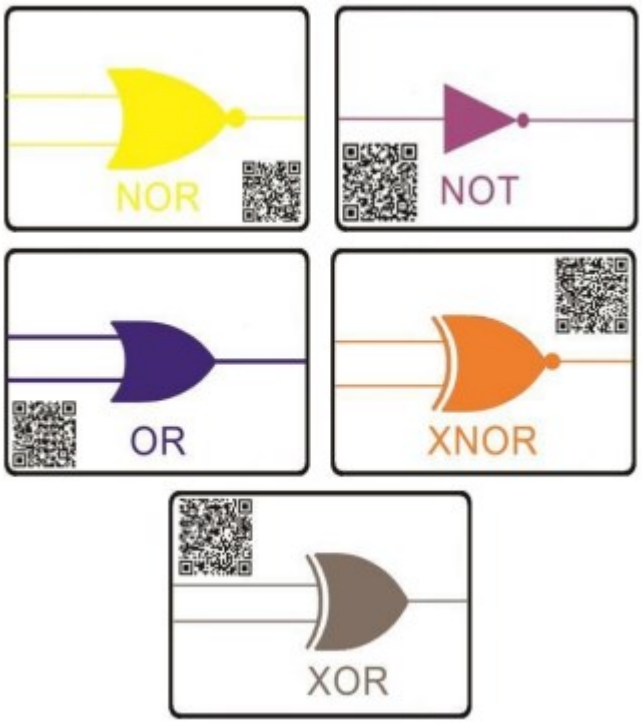

Figure 1. Gateway Logic Marker Card Models

To form a logical sequence, one more marker card is required as the logical gateway of the processor, as described in Figure 2 below.

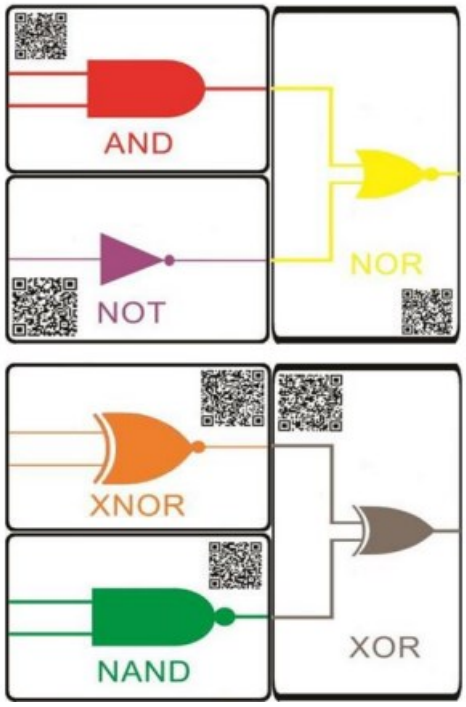

Figure 2. Network Logic Marker Card Models

2. Development Stage

The product used to create Android Learning Media using AR is Unity. Pictures of AR application gates and logic sets can be seen below.

Figure 3. Main page view

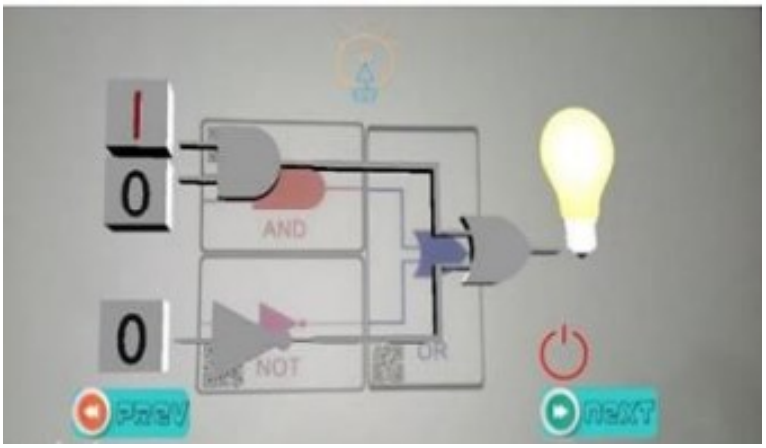

Figure 4. Scanning Markers Display as well as Running Network Logic Learning

3. Evaluation Stage

Discussions about the practicality, effectiveness and validity of learning media using AR with validation of two people, i.e. an expert in the field of material and a expert in media are with the results below.

Table 1. Validation Result

No	Media Element	Average
1	Programs	4,22
2	Design	4,53
Material Element		**Average**
1	Learning	4,72
2	Content	4,68
Average		4,54
Category		Very Valid

Based on the validation values presented in Table 1 above, it is known that the average of an expert in the field of material and one expert in media in android learning logic gates and augmented reality-based logic sets used to support learning is 4.54 with very valid categories.

CONCLUSION

The development process of the Android learning media utilizes AR on the material of a series of practical, effective and valid logic related to the implementation of the ADDIE method that consists of five stages namely analysis, design, development, implementation and evaluation. The average validity score of android learning media using AR is 4.54 with very valid category. Based on the response of the students to the Android learning media using AR, it's apparent. At least 80% of students responded in agreed categories for each element responded. In other words, students have a very good feedback on learning media using AR developed so that android learning media utilizes AR in practical categories. 85% of students achieved a score above the KKM, so the learning media utilizing this AR belongs to be effective. Based on the results of this study, the researchers assume that in the future, increasingly advanced technology will no longer limit the learning media.

Educators can be more innovative in creating diverse media such as learning logic networks so that students are more interested in learning activities.

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