Augemented Learning Media Design At SMKN 8 Padang

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Abstract **- The rapid advancement of information and communication technology has transformed various media, enabling individuals to process knowledge more efficiently and innovatively. Smartphones, which are vital tools in everyday life, significantly contribute to different sectors, particularly education. Utilizing smartphones as educational tools can lead to more captivating and efficient materials while maintaining the essential content. Augmented Reality (AR) has surfaced as a groundbreaking medium in education, merging the physical world with digital objects, which can boost student engagement and improve learning outcomes. This study employs the Multimedia Development Life Cycle (MDLC) approach to create an AR-focused learning media application. This research demonstrates that the utilization of Augmented Reality (AR) in learning can enhance interaction, student engagement, and conceptual understanding. With immersive 3D visualization, the material becomes easier to comprehend. The feasibility test results of 85.5% indicate that this application is effective in supporting a more engaging and innovative learning experience. These results highlight the promise of AR in improving the learning experience and interaction between educators and students.**

***Keywords*— Augmented Reality in Education, Learning Media, MDLC,**

I. INTRODUCTION

In the current era of globalization, the quick advancement of technology offers numerous advantages for education. In today's world, using technology to help with work has become indispensable. Human resource development must keep pace with technological improvements [1]. People who use technology must be able to use both existing and emerging technologies. This technological advancement also helps create more engaging, efficient, and concise learning materials without sacrificing the core of the content being taught. During the teaching and learning process, learning media can assist teachers and students in communicating. For the teaching and learning process to run smoothly and for students to understand the material taught by the teacher, media serves as a bridge to foster relationships and engagement between educators and students.

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Augmented Reality (AR) is one type of media that can be utilized in the field of education. The technique known as "augmented reality" combines the real world with two or three-dimensional virtual objects [2]. One advantage of using augmented reality is that it encourages children to think critically about everyday events. With the help of this media, students can learn anytime and anywhere, whether under the supervision of a teacher or independently. Due to its appeal and ability to project information in real-time, augmented reality can also enhance learning outcomes and student interest. This is because augmented reality and learning media share similarities in their ability to motivate and engage students in the learning process while facilitating the exchange of information between teachers and students [3]. In a study carried out by Deloitte, 83% of students indicated that they favor learning through AR technology over traditional teaching methods [4].

Learning materials can also be made more interesting with the help of augmented reality technology. With this technique, more virtual objects can be displayed alongside the real world. Users utilizing augmented reality can interact with both real and virtual objects simultaneously, making the virtual objects seem as if they exist in the real world [5]. As a result, its use can enhance the collaborative experience between the real space and the virtual space as an educational tool.

II. METHOD

MDLC is one of the methods used. The Multimedia Development Life Cycle (MDLC) is an effective method for designing or building educational media applications [6]. The Multimedia Development Life Cycle (MDLC) or multimedia development life cycle is a set of procedures that must be followed to produce high-quality multimedia products that can meet user needs. Concept, design, material collection, assembly, testing, and distribution are some of these phases. The six phases in the MDLC method can be used in any

sequence and are not required to be completed in that order. However, prioritizing the concept stage is necessary [7].

The Model Development Life Cycle (MDLC) method is chosen because it provides a structured and systematic approach to software development, ensuring that quality is maintained and the likelihood of errors is reduced. This method also allows for greater user involvement, enabling their needs to be effectively met. The flexibility of MDLC allows for adjustments to various types of projects, while the iterative evaluation and testing phases help identify risks early on.

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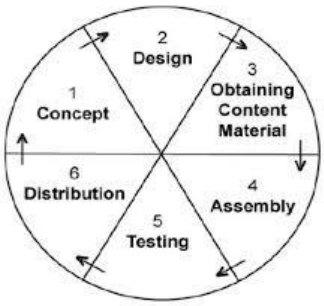

Figure 1. MDLC Model

A. *Concept*

The idea stage is the initial phase of the MDLC cycle. Defining the program's objectives and target users is the first step in the concept stage of application development [8]. The design concept for this basic orientation TJKT application is presented in Table 1.

Table 1. Desain Concept

Concept Category	Concept Description
Application Title	Design and Development of Augmented Reality-Based Learning Media.
Multimedia Type	Learning media using augmented reality technology to display network devices in three-dimensional form.
Purpose	To use augmented reality technology to develop an engaging, imaginative, and up-to-date learning media application that assists the educational process for teachers and students.
User	Students and teachers of class X vocational schools studying the material on Basic Orientation of Computer Network and Telecommunications.
Minimum Specifications for Augmented Reality Application	Minimum requirement of Android 8.0 Oreo is needed to access this application on smartphones running the Android operating system.
Augmented Reality Learning Media Concept	This augmented reality learning media will use markers to create 3D objects representing the material on Basic Orientation of Computer Network and Telecommunications.

Based on the concept table above, in summary, this application displays network devices in three-dimensional form on the smartphone screen by utilizing augmented reality technology. The goal is to use AR technology to provide an engaging, inventive, and instructive learning media application.

B. *System Design*

An overview of the system to be used in the development of the basic orientation TJKT application is provided in this design stage. The following is the system design that will be created:

a. System Block Diagram

The design of this tool incorporates a block diagram into the operations and principles of the system. The block diagram [9] illustrates how the tool to be produced operates. Figure 2 explains the block diagram of the system that will be designed.

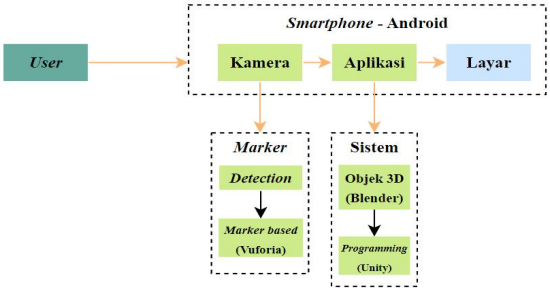

Figure 2. Block Diagram

The input component of this system is the Marker that has been created and uploaded to Vuforia. The process part consists of the Android application connected to the system, which is programmed using Unity software and the 3D models created with Blender software. The output component is connected to the input component after the procedure is completed, and the system will display the application interface on the smartphone screen.

b. Flowchart

The application design is based on a flowchart structure, which illustrates the workflow of the system [10]. The workflow of a process can be organized using a flowchart. Figure 3 shows the process of the basic orientation TJKT learning media application system.

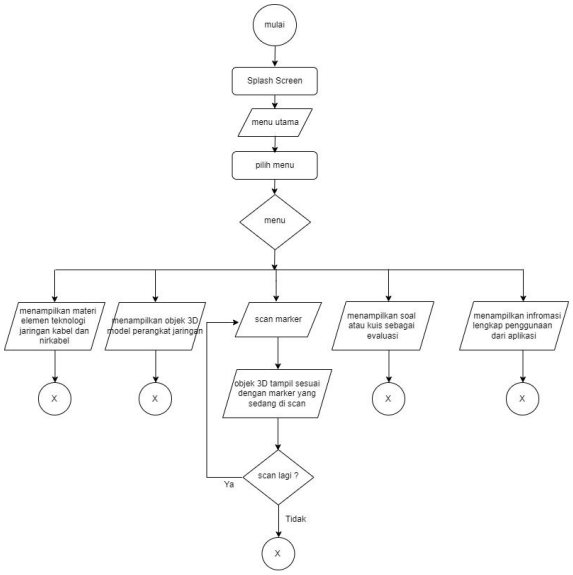

Figure 3. Flowchart

Figure 3 illustrates how the app's workflow starts with the main menu, which includes buttons for quizzes, networking tools, networking devices, information, and user manuals.

c. Use Case Diagram

Is a representation of the functionality of a system that shows the relationship between actors and the system [11]. The following is a use case that shows the actor's role in communicating with the system.

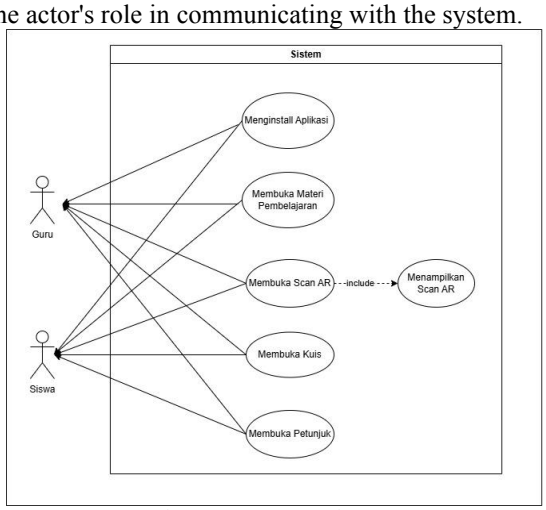

Figure 4. Use Case Diagram

d. Activity Diagram

The complete program flow, from application installation to end use, is depicted in the activity diagram. The flow of different system activities is depicted in the activity diagram, along with how each action starts, what possibilities arise, and how it is completed [12]. A system activity diagram looks like this:

1) Activity Diagram of Learning Material Menu

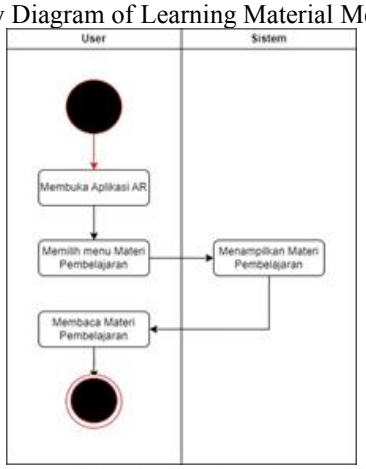

Figure 5. Activity Diagram of Learning Materials

2) Activity Diagram of Network Tools Menu

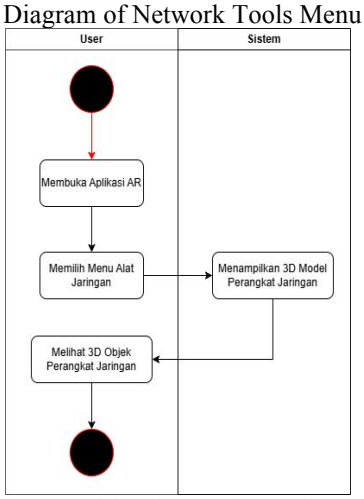

Figure 6. Activity Diagram of Network Tools

3) Activity Diagram Menu Scan AR

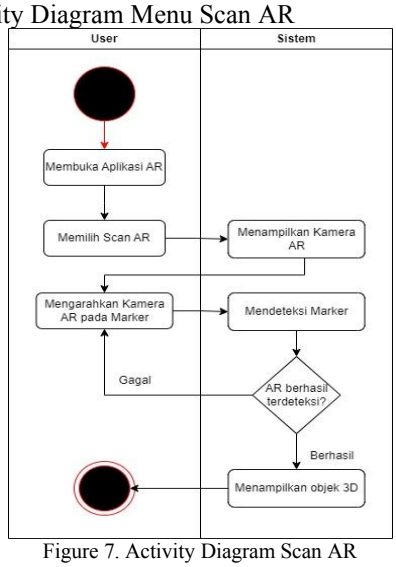

Figure 7. Activity Diagram Scan AR

4) Activity diagram for quiz menu

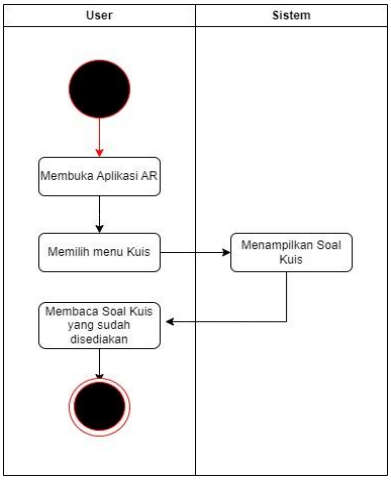

Figure 8. Quiz Activity Diagram

5) Activity diagram for information menu

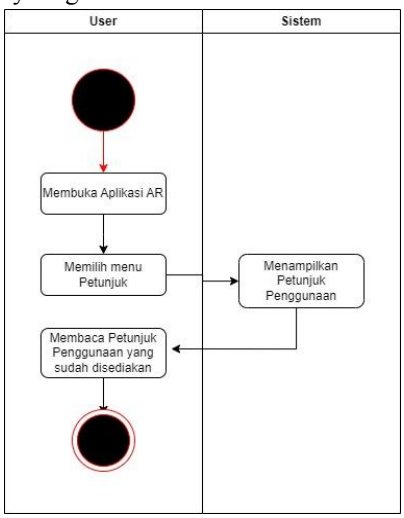

Figure 9. Information Activity Diagram

C. *Material Collecting Stage*

The collection of materials is a process of gathering resources that meet the specified needs. At this stage, the supplies needed to complete the tasks are collected. These resources include visuals, sounds, indicators, and instructional materials [13]. The assembling procedure can be carried out simultaneously with this stage; the materials used in the development of this basic orientation application for TJK are 3D objects created using Blender 3D and imported into Unity.

D. *Assembly Stage*

Managing all the materials that have been collected and ensuring that they meet the criteria of the work is a task completed at this stage [14]. The design stage, where all multimedia assets or resources are compiled using the Unity 3D program according to a predetermined plan, forms the basis for the development of this TJKT basic orientation application. This process also includes application coding to ensure that all buttons and icons function correctly.

E. *Testing Stage The*

testing stage is carried out after the assembly stage is complete, where the program or application is run to identify any errors [15]. This step is very important because the developed model must be tested to ensure its quality and reliability before it is applied in a production environment.

At this stage, a User Acceptance Test (UAT) is conducted to ensure that the developed learning materials meet the users' needs. This test aims to collect feedback from respondents regarding the system that has been designed. The method used involves distributing questionnaires or survey questions, where each question has a certain assessment weight. Respondents for the TJKT Basic Orientation AR application consisted of ten grade X students from the Computer and Network Engineering (TKJ) program.

F. *Distribution Stage*

Deploying software or applications that have been developed to end users or end users.

III. RESULTS AND DISCUSSION

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A. *Design Results*

a. Main Menu Page

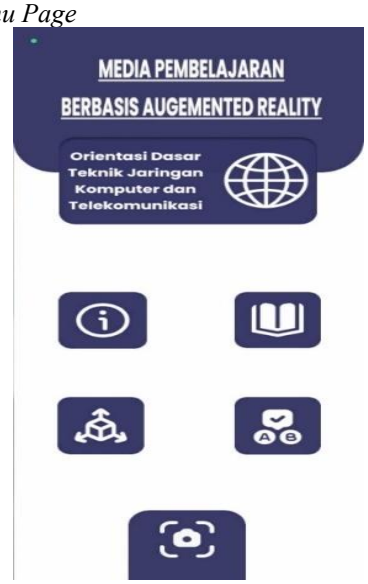

Figure 10. Main Menu Page

Figure 10 illustrates the main menu page, where users see what menus are available in this application, such as the Instructions menu, Learning Materials, 3D Model, Quiz and Scan AR.

b. Instructions Page

Figure 11. Instructions Page

In Figure 11 illustrates the instructions page, the application displays the functions of the buttons in the application.

c. *Learning Material Page*

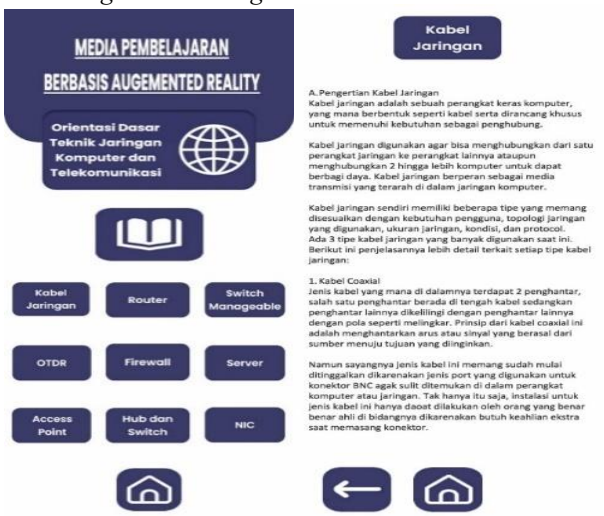

Figure 12. Learning Materials page

Figure 12 illustrates the learning material page, where the application will display the material in the basic orientation element of tjkt.

d. *3D Model Page*

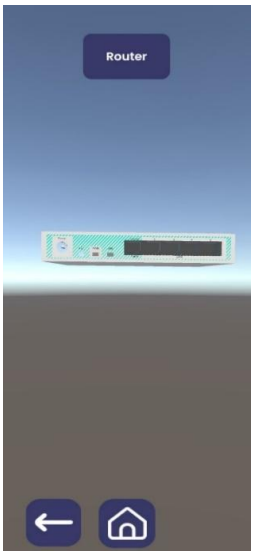

Figure 13. 3D Model Page

Figure 13 depicts the 3D model page, which displays a 3D model of the network device.

e. *Quiz Page*

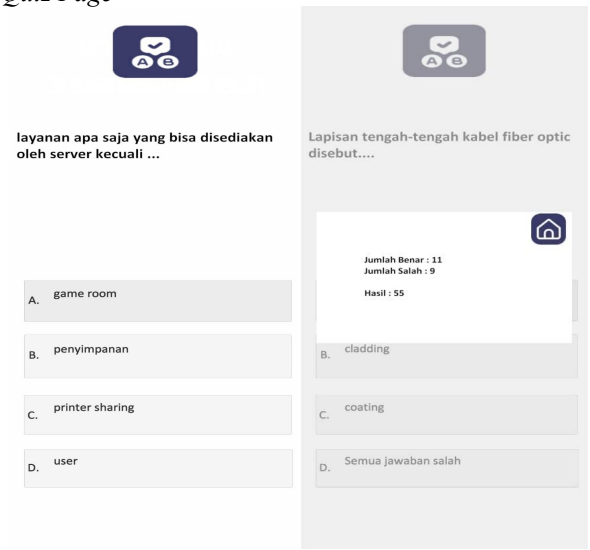

Figure 14. Quiz Page

The quiz page, where the program displays a number of questions related to the basic orientation of TJKT, is shown in Figure 14. The purpose of this display is to measure the extent of students' understanding of the material.

e. *AR Scan Page*

Figure 15. AR Scan Page

The AR scanning page, which prompts users to point their device's camera at a specific marker, is seen in Figure 15. The part used to scan the marker is indicated by the visible camera area. Users can use their device's camera to scan markers through this page, which will activate network device-related materials and provide an interesting augmented reality experience.

By scanning, users can see 3D objects or additional information appearing on the screen, thus enhancing their understanding and engagement in the learning material. The purpose of this function is to make learning more immersive and engaging.

B. *Testing Results*

This application testing is carried out by users, namely class X TJKT students to assess the extent to which the application meets the expected quality standards. UAT criteria are important elements used to assess the effectiveness of a system before its official launch. First, engagement measures how actively users participate in the testing process. Second, usability evaluates how easy and intuitive the system is to use. Third, understanding ensures that users can comprehend the functions and features available. Next, user satisfaction gathers feedback regarding their overall experience. System performance is also evaluated, including aspects of speed and stability. Finally, alignment with requirements ensures that the system meets all established criteria. By considering these criteria, the development team can ensure that the system is ready for use and meets user expectations. In this case, testing was carried out by 10 students, with the following results:

Table 2. UAT test results

Respondents	Assessed Aspect			
	Design	Application Information	Usability	Ease
1	20	20	20	20
2	19	17	20	18
3	19	17	16	15
4	17	17	20	17
5	13	17	18	19
6	15	15	16	15
7	17	15	15	15
8	17	15	17	13
9	17	16	17	16
10	19	18	20	17
Total Percentage	346%	334%	358%	330%
Average	86.5%	83.5%	89.5%	82.5%

In table 2 there is an average presentation of UAT testing. To calculate the results of its feasibility as follows:

$$\text{Kelayakan} = \frac{\textit{Jumlah Seluruh Presentase}}{\textit{Jumlah Aspek}}$$

$$\text{Kelayakan} = \frac{342}{4} = 85{,}5\%$$

The average overall score of the User Acceptance Test, which was attended by ten students, is 85.5%, which means that the augmented reality-based basic orientation learning media application is categorized as "Worth Using".

C. *Discussion*

An innovative augmented reality (AR) based interactive learning media application is the result of this research. Initial images used as backgrounds, buttons, and menus of the application were created during the development process using the Figma design tool. Blender, a 3D design program, was then used to create different types of computer hardware for use with the Augmented Reality learning material.

The program can precisely identify and track markers and display 3D objects thanks to the use of Vuforia as a marker and 3D object recognition platform. The overall interactive and engaging Augmented Reality application was created using Unity as the application development platform. With the use of these resources, this research successfully produced learning materials that successfully combine augmented reality technology with attractive visual content, providing a dynamic and engaging learning experience for its users.

IV. CONCLUSIONS

An innovative step that can be accessed anytime and anywhere is the development of Augmented Reality Based Learning Media Applications for Basic Orientation Elements of TJKT in class X TJKT.

The MDLC (Multimedia Development Life Cycle) method, which includes the following stages: concept, design, material collection, assembly, testing, and distribution, is used in the creation of this augmented reality application for basic TJKT orientation.

This program was created with the aim of increasing student motivation and overcoming the limited cost of providing teaching aids that can be replaced with 3D objects and their animations. Thus, our program not only offers a useful solution, but also makes learning more dynamic and interesting for students.

This study has several limitations, including a limited sample size of only 10 students, which may not fully represent the application's effectiveness on a larger scale. Additionally, technical aspects such as compatibility with various devices and system stability over long-term use need further evaluation. For future development, the study can be expanded by involving more participants from different educational levels and incorporating features such as personalized learning materials and integration with other technologies to enhance the user experience.

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