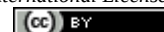


Development of Augmented Reality Learning Media for Informatics Subjects in Class VII of SMP Negeri 1 Gondang Tulungagung

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ABSTRACT

The limitations of learning media cause the learning process carried out at SMP Negeri 1 Gondang to only rely on teachers who use lecture methods with sources from textbooks. This results in students not understanding the material presented. This study aims to develop Augmented Reality learning media for seventh grade students at SMP Negeri 1 Gondang. This research is a type of development research, using the ADDIE development model (Analysis, Design, Development, Implementation and Evaluation) because the development stages are arranged in a programmed manner with a systematic sequence of activities. The process of developing Augmented Reality learning media was developed using the Unity application. In this study there are validity tests from media experts and material experts as well as field tests in small groups and large groups. The validation results from media experts are 84.7% included in the very appropriate category, while the results of material experts are 95.8% and included in the very appropriate category. After obtaining the validity results, they are then tested on students. The small group obtained results of 93.8% which are included in the very appropriate category, while the large group obtained results of 90% which means that the experiment is included in the very appropriate category.

1. Introduction

Education in Indonesia must keep pace with the rapid development of information technology. Technology has become a supporting tool to facilitate learning [1], [2], [3]. This necessitates innovation in education to make the learning process support technological advancements. Information technology plays a significant role in education [4], [5]. Technological advancements have a significant impact on innovation in the learning process. Learning media is one component that supports effective learning [6]. Regarding the use of learning media, not all schools are able to incorporate learning media into the learning process. Currently, at SMP 1 Gondang Tulungagung, during Informatics lessons, the learning resources used by students are limited to books available in the library. This is supported by the opinion that the majority of schools still do not utilize media in the learning process [7].

Interviews with Informatics teachers also revealed problems such as students relying solely on teachers for explanation/lecture methods, current learning resources are limited to supplementary textbooks and textbooks provided by the library. Therefore, it is difficult to find supporting media that matches the material in various learning resources, and informatics is a subject that is

difficult for students to understand, as evidenced by the average student score of 75, the lowest compared to other subjects. Furthermore, during observations at school, the majority of students use smartphones as a means of communication and searching for information on the internet. Smartphone use by students is still underutilized. Students are also interested in learning media, especially modern ones, in line with the opinion that digital learning is more interesting than lecture methods [8], [9]. Therefore, an Android-based learning medium is needed that students can use to support the learning process. In line with technological developments in education, particularly involving learning media, SMPN 1 Gondang can utilize learning media to support learning in Informatics. Learning media designed to support the learning process must of course be tailored to the needs identified in the existing problems.

Augmented reality is a technology that combines two-dimensional or three-dimensional virtual objects into a real three-dimensional environment and then projects these virtual objects in real time [10], [11], [12]. Augmented reality can provide additional information packaged in a multimedia concept, thereby improving the quality of learning through the depiction of the system created for students [13], [14]. Another opinion states that Augmented Reality (AR) is the latest

technology as a solution for educators to present innovative, informative, and engaging learning [1], [15], [16]. With Augmented Reality, students can view computer-generated simulations and also become a learning process using technology. Augmented Reality learning media in the learning process can create a different atmosphere in learning, increase students' desire to learn, and enhance understanding of the material, thereby improving student learning outcomes [17], [18], [19]. Based on the above description, innovations in learning using Augmented Reality learning media were created. Therefore, research was conducted using Augmented Reality learning media for students in Informatics subjects. This research is an effort to improve student understanding by providing learning innovations using Augmented Reality learning media that can be aligned with technological advances in Informatics subjects.

2. Research Method

This type of research is research that develops learning media so it is known as the term Research and Development. The ADDIE development model (Analysis - Design - Development - Implementation - Evaluation) was chosen for the development of Augmented Reality learning media, because the model is arranged in a programmed manner with a systematic sequence of activities in an effort to solve learning problems related to learning resources that suit the needs and characteristics of students. The selection of this development model is based on a product-oriented development model. The stages of the ADDIE Development model are presented in Figure 1.

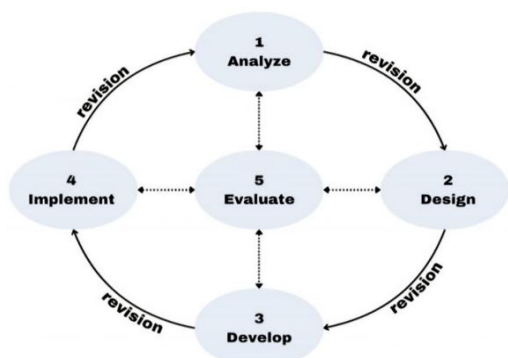


Figure 1. ADDIE development model

Figure 1 explains that the ADDIE development model consists of 5 stages, namely:

- 1) Analysis, the initial step to analyze needs or identify problems to identify gaps that occur in the learning process.
- 2) Design, At the design stage, the focus is on activities such as selecting materials to create a developed design that is tailored to the competency demands and characteristics of students, the implementation of the strategies used, and the form of assessment and evaluation. The stages carried out

include media selection and selection of formats and materials.

- 3) Development, This stage develops design specifications into a physical form to produce a product. Activities in this stage are developing media in accordance with the initial design plan that was made and compiled at the design stage.
- 4) Implementation, namely the stage of implementing the developed media in real situations in the classroom during the learning process of class VII SMP N 1 Gondang Tulungagung to determine the feasibility of the media.
- 5) Evaluation, an evaluation is carried out to assess whether the developed learning media is appropriate and achieves the desired results. At this stage, validity tests are carried out with material experts and media experts as well as product trials through the field.

2.1. Research Subjects

The subjects of this study were 30 seventh-grade students at SMP Negeri 1 Gondang.

2.2. Data Analysis Techniques

Data from the validity test of the augmented reality learning media development were analyzed using:

- 1) Validity test, conducted with material experts and media experts to determine whether the developed augmented reality learning media was suitable for testing with students
- 2) Field trial, conducted with small and large groups to determine whether the developed media was suitable.

3. Result and Discussion

This augmented reality learning media was developed to facilitate teachers in the teaching and learning process, enabling students to better understand the material presented by teachers through engaging learning innovations.

3.1. Development Results

The augmented reality learning media developed in the form of an application includes the page components presented in Figures 2 to 9.

- 1) Initial Menu Page and Main Menu Display



Figure 2. Initial Menu Page

Figure 2 displays the initial menu, which contains the learning media's identity and a start button to begin and an exit button to exit.

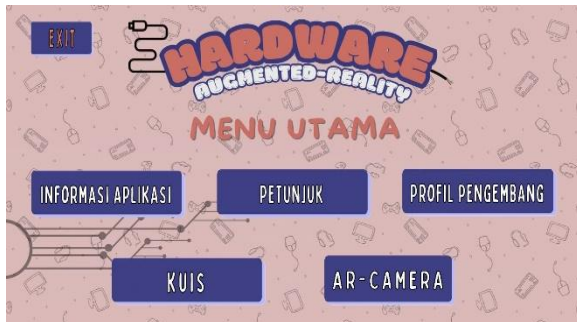


Figure 3. Main Menu Page

Figure 3 displays the main menu, which consists of five button options and one back button. The buttons navigate to the selected menu page, including application information, instructions, developer profile, quiz game, and AR-camera.

2) AR-camera Display



Figure 4. AR-camera Display

Figure 4 shows the page for activating the AR camera. When the camera is pointed at a marker, a 3D hardware object will appear. This menu also includes a refresh feature to reload and an exit button to exit the AR-camera.

3) Application Information Display



Figure 5. Application Information Page

Figure 5 displays application information consisting of learning objectives and materials, as shown below.



Figure 6. Learning Objective Display



Figure 7. Hardware Material Display

Figure 6 displays the learning objectives page for the material contained in the learning media, while Figure 7 displays the material page, which includes the definition, function, and types of hardware.

d. Quiz Display Page

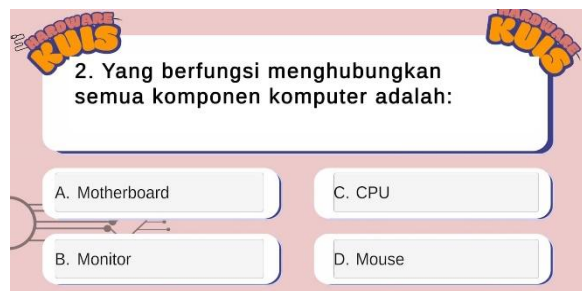


Figure 8. Quiz Page

Figure 8 displays a quiz page containing multiple-choice questions as a student evaluation after completing the material. The quiz includes information about correct and incorrect answers, allowing students to assess their abilities.

e. User Instructions Page



Figure 9. Home Menu Page

Figure 9 displays instructions on how to use this hardware application, as well as how to use the AR camera.

3.2. Discussion

This augmented reality learning media was distributed and piloted to seventh-grade students of SMP Negeri 1 Gondang Tulungagung. The media was first tested for validity by material experts and media experts before being field-tested. Field trials were then conducted with small and large groups.

3.3.1 Validation Test

Expert validation was conducted to assess the appropriateness of the developed materials and media for content and presentation. Media expert validation was conducted by lecturers at Bhinneka PGRI University in Tulungagung, while material expert validation was conducted by informatics teachers at SMP Negeri 1 Gondang Tulungagung. The aspects assessed in this validity test included statements about the content and presentation of the media. Validity Test will be presented in Table 1.

Table 1. Validity Test

Validity aspects	Presentase	Category
Media Expert	84.7%	Very Eligible
Material Expert	95.8%	Very Eligible

3.4 Field Trial

The field trial was conducted to determine the appropriateness of the media for seventh-grade students. A small group trial was conducted with five students. A large group trial was conducted with 25 students. The aspects assessed included the content and presentation of the media. Product Trial will be presented in Table 2.

Table 2. Product Trial

Trial Aspects	Presentase	Category
Small Group Trial	93.8%	Very Appropriate
Large Group Trial	90.9%	Very Appropriate

Based on Table 2, the small group assessment received a percentage of 93.8%, while the subject matter expert received a percentage of 90.9%, so both were declared very appropriate.

4. Conclusion

Based on the results of the research conducted, the augmented reality learning media designed and developed for seventh grade students of informatics subjects obtained "very appropriate" results. The results of the validation test from media experts were 84.7% while the results of material experts were 95.8%, both of which were included in the very appropriate category. The media was tested on students, in small groups it obtained results of 93.8% while in large groups it obtained results of 90% which means that the trial had entered the very appropriate category.

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