



Development of Camera and Lens Recognition Learning Media Based on Augmented Reality

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Abstract: This study aims to produce learning media for the introduction of cameras and lenses in Photography subjects using Augmented Reality technology that can be run through smartphones with the android platform. The research method adopted a research and development method using the ADDIE development model, which consisted of five stages: analysis, design, development, implementation, and evaluation. In this research, the stages were limited to the development stage. In designing this photography learning media, the application was made using Unity software, Blender and for database management Vuforia. The instrument used in the study was a learning device validation sheet consisting of several validation sheets, namely: syllabus validation sheet, lesson plan validation sheet, validation sheet and teaching materials. The technique used in this research was observation, interviews, and collecting questionnaires used in data analysis both quantitatively and qualitatively. Validation used expert judgment for the quantitative and qualitative aspects of the assessment representing strongly agree, agree, disagree and disagree. The final result of this research is an Android-based photography learning media that uses Augmented Reality technology.

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Introduction

Covid-19 is currently still colonizing the country of Indonesia, where the spread of this disease is very fast from one to the other. Not only in Indonesia, even the world is currently being hit by a health crisis due to Covid-19 (Buliali, 2021; Novaliendry, Huda, Sanita, et al., 2021). Initially the spread of Covid-19 only had an impact on starting economic activities, as reported by the daily news Kompas (2020) the government in all regions also made road closure policies to regional restrictions for residents who wanted to go in and out of an area which was also called lockdown (Fadhilaturrehmi, Ananda, and Yolanda 2021; Wafa and Fahmi 2020). Now, the world of education is also affected by this disease (Mandasari et al., 2021). In order that education can continue to run properly, the President has given instructions to stay at home, study at home, work at home and worship at home. The Minister of Education, Culture, Sports, Science and Technology (Mendikbud) pursued this guideline through a Circular Letter (SE) No. 4 of 2020 on the implementation of educational guidelines when Covid19 needs to be disseminated, that is, learning from home online or through distance learning to providing a new learning experience for students (Novaliendry, Huda, Sanita, et al., 2021), without feeling burdened with demands to complete all curriculum achievements both for grade promotion and graduation (Pakpahan and Fitriani 2020; Nistrina 2021; Wibowo and Saepuloh 2020; Mandasari, Subandowo, and Gunawan 2021).

This has a very big impact on learning activities that should be carried out in a practical way by students (Ananda Saraswati & Mertayasa, 2020). This practical learning requires a fairly expensive tool so the learning process from home runs less effectively (Novaliendry, Huda, Maulana, et al., 2021; Rafendi et al., 2020). On the other hand, this practicum activity cannot be simply eliminated so it is in line with the nature of learning photography. To support learning that it continues to be carried out and conveyed properly, Augmented reality-based learning media have been developed as distance learning tools to support learning in a way that is performed correctly and continues to be communicated (Novaliendry, Huda, Sanita, et al., 2021). So students can follow the learning process well without having to have complete practical tools (Yaacob et al., 2021).

Augmented reality is an application that combines the real and virtual worlds in the form of 2D or 3D projections in the real world (Hakim 2018; Ramadhan, Putra, and Surahman 2021). The existence of the Augmented Reality application concept seems to be a solution for teachers in overcoming the limitations of online learning for Vocational High School students in overcoming learning obstacles that should be done practically (Krishna Pillai et al. 2021; Wibowo and Saepuloh 2020; Kurniawan 2017). Another benefit is that the learning media applied is more advanced by utilizing Augmented Reality technology so it can overcome the purchase of relatively expensive tools that students cannot buy to study at home (Haida Dafitri, Arief Budiman, and Fakhrana Nadhila 2020; Hakim 2018).



Figure 1. AR Work Diagram

Source : www.google.com

The specific purpose of this research is to learn media using effective, practical and effective augmented reality techniques (Novaliendry, Huda, Sanita, et al., 2021). The urgency of this research is that photography is a compulsory subject in Vocational High Schools (SMK) in the Multimedia department but has difficulties when it comes to doing practicals at home. If this condition continues, the learning process will definitely be ineffective and will have an impact on other materials in this photography subject. Thus, alternative solutions must be found through the development of learning media for the introduction of cameras and lenses in Photography subjects using Augmented Reality technology that can be run through smartphones with the Android platform.

Research Method

Researchers used Augmented reality technology by describing various kinds of objects that existed on electronic media in real time. The information displayed by the virtual objects helps students perform their actual activities. In the validator's opinion, the developed learning tools should be of high quality, realistic and usable by teachers and students. Learning tools have the desired effect, with a positive reaction from students to the learning tools in photography. Meanwhile, the system that would be built by the researcher was using the Android operating system with Augmented Reality technology.



This research was conducted at SMK Negeri 2 Pariaman from August to September 2020. The scope of this research was Multimedia Department students who were registered in class XI of the 2020/2021 academic year, totaling 20 students. The study focused on the phase of developing augmented reality-based photo learning tools using the smartphone platform by quantitatively and qualitatively analyzing validator evaluation results. The researcher chose the ADDIE development research model (Nugraha et al., 2021) as a reference for developing photography learning tool. The steps for the ADDIE development model are: (Nugraha et al. 2021; Cahyadi 2019).

- 1) Analysis phase (Analysis) will be carried out analysis of the current system, analysis of problems and solutions and analysis of the proposed system in accordance with the conditions at SMK Negeri 2 Pariaman
- 2) The Design Stage, which is the stage in making the design of learning media
- 3) Development stage, namely the process of implementing the design that has been made at the design stage.
- 4) Implementation stage is the stage of testing the learning media for students.
- 5) Stage Evaluation (Evaluation) at this stage the learning media is assessed to determine the quality of the feasibility of the learning media that have been developed.

The instrument used by the expert was in the form of a validation sheet to assess the quality of the developed learning device (Krismadinata et al., 2020). Experts review and evaluate the quality of each component of each selected learning device. The equipment for measuring the effectiveness of this learning device consisted of several verification sheets: a curriculum verification sheet, a curriculum verification sheet, a verification sheet, and a learning device verification sheet consisting of teaching materials. The average score for each aspect calculates the data obtained from expert validation of learning tools. Techniques for analyzing the validity of learning tools used quantitative and qualitative descriptions. The techniques used in collecting data in this study were 1) Observations were made to students regarding the conditions of smartphone use, 2) Interviews were conducted to collect data about the learning process in the classroom, and 3) Questionnaires to collect data to be used in technical data analysis (Wibowo and Saepuloh 2020; Nugraha et al. 2021).

The data used in the form of qualitative data and quantitative data to determine the quality of learning media product data (Sari et al., 2020). Quantitative data from this media was in the form of giving a score of 4 (strongly agree), 3 (agree), 2 (disagree), 1 (Disagree). While the qualitative data of learning media were SS (strongly agree), S (agree), KS (disagree), TS (disagree). To determine the criteria for media quality, it was done by calculating the total score obtained from each respondent who had filled out the questionnaire (media experts, material experts, and students) and were then calculated by the formula:

$$K = \frac{F}{N} \times I \times R$$

Description :

K : Percentage of eligibility

F : Total number of respondents' answers

N : Highest Score in the questionnaire

I : Number of questions in the questionnaire

R : Number of respondents

After knowing the percentage of eligibility, then an interpretation was carried out according to the following table.

Table 1. Feasibility Presentation

Percentage	Criteria
$0\% \leq K \leq 20\%$	Very Inappropriate
$20\% < K \leq 40\%$	Less Worthy
$40\% < K \leq 60\%$	Enough
$60\% < K \leq 80\%$	Worthy
$80\% < K \leq 100\%$	Very Worthy

Learning media was said to be suitable for use if the percentage of the feasibility of learning media was more than 60% with proper criteria. The reliability of the learning device validation sheet was determined based on the percentage of observer consent by ensuring that the validator being validated was using the validation sheet consistently (Borich, 2016). Questionnaires were used to determine student responses to the use of the developed learning tools. The results of the questionnaire were evaluated quantitatively and qualitatively.

Results and Discussion

This application is one of the interactive and communicative learning media. This learning media is designed to make it easier for class XI SMK students to understand the introduction of cameras and lenses in schools. This learning media can be used anytime and anywhere with the appearance of 3D image objects that can be seen directly by students.

a) Stages of Analysis

1) Running System Analysis

Running system analysis is performed by analyzing the objects needed to design a system that need to focus on the functionality of the running system, rather than on the process flow of the system.

2) Problem Analysis and Solution

Analysis of problems and solutions is an analysis of the problems that occur in the field and the solutions given to solve these problems.

3) Proposed System Analysis

After analyzing the current system and analyzing problems and solutions, the next stage is the design of the proposed system. At this stage, learning media for the introduction of camera and lens types in photography subjects will be designed using Augmented Reality technology.

b) Design Stage

At this stage, the design of the textbook is carried out as a marker to run the application. The initial preparation of this textbook is to determine the material for which the media will be made, besides that, evaluation instruments or quizzes are also carried out to be able to determine the ability of students at the end of the meeting.

c) Stages of Development (Development)

This development stage is the stage where the learning media developer carries out the media creation process, which aims to produce interactive Augmented Reality-based learning media. Where the development of this media combines textbook learning media with Augmented Reality technology, so that the introduction of material in the form of objects can be known indirectly by its shape and function.



Figure 2. Loading Page Interface Display

Next, go to the menu page.



Figure 3. Menu Page Display

Then go to the Scan Marker display page.

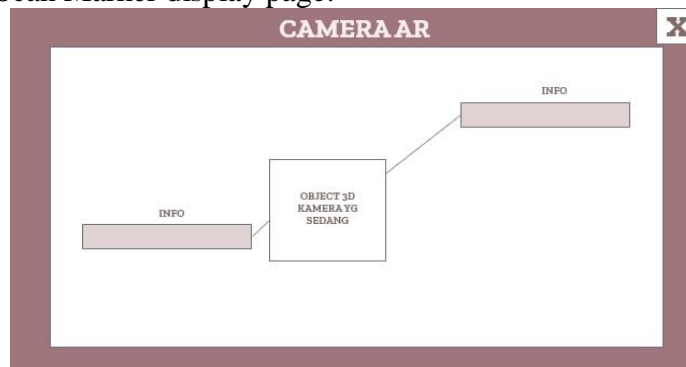


Figure 4. Interface Scan Marker

Quiz interface page.



Figure 5. Quiz Interface Display

Application RPP interface page.



Figure 6. Interface Rpp Application

Application Guide interface page.

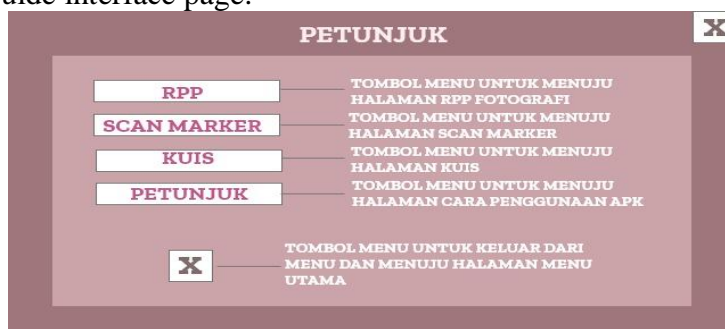


Figure 7. Application Instruction Interface Display

Based on the results of the validation of augmented reality-based learning media by the two validators. It can be seen that the results of the assessment by the validator with an average percentage of both values of 84.47% are categorized as "very valid" based on the media validation category table.

1	2	Jabatan Responden	Email Responden	Praktikalitas				Total (x1)	Tampilan							Total (x2)	Kemudahan			Total (x3)	Keuntungan				Total (x4)
				x1.1	x1.2	x1.3	x1.4		x2.1	x2.2	x2.3	x2.4	x2.5	x2.6	x2.7		x3.1	x3.2	x3.3		x4.1	x4.2	x4.3	x4.4	
3	Siswa	agussupratman568@gmail		5	5	5	5	20	5	4	5	5	5	5	5	34	5	5	5	15	5	5	5	5	20
4	Siswa	elfirahmi.rahmi@gmail.com		5	5	5	5	20	5	4	4	5	5	5	5	33	5	5	5	15	5	5	5	5	20
5	Siswa	eyha07@gmail.com		4	5	4	4	17	4	4	4	5	4	5	4	30	5	5	5	15	4	5	4	4	17
6	Siswa	andrisukarman7@gmail.com		5	5	4	4	18	5	4	4	5	5	5	5	33	5	5	5	15	5	5	4	4	18
7	Siswa	muhdyusuf110898@gmail.com		5	5	5	5	20	4	4	5	5	5	5	5	33	5	4	5	14	5	5	5	5	20
8	Siswa	ihsanulkamil.ik@gmail.com		5	5	5	5	20	4	4	3	4	4	5	4	28	4	4	4	12	5	5	5	5	20
9	Siswa	fanesaceci@yahoo.co.id		4	4	4	4	16	4	4	4	4	4	5	4	29	4	4	4	12	4	4	3	4	15
10	Siswa	verizalsutanpamenan@gmail.com		4	5	4	5	18	5	4	3	5	4	5	4	30	4	4	4	12	4	5	4	4	17
11	Siswa	furqonnajwa@gmail.com		4	5	4	5	18	5	3	4	4	4	4	5	29	5	4	5	14	4	5	4	4	17
12	Siswa	afadman.hamid@gmail.com		5	5	5	5	20	5	4	4	4	5	5	4	31	5	5	4	14	5	5	5	5	20
13	Siswa	anitayusmar@gmail.com		5	5	5	5	20	5	5	5	5	5	5	5	35	5	5	5	15	5	5	5	5	20
14	Siswa	muthiaatikatriananda@gmail.com		2	5	5	5	17	5	5	4	5	4	4	5	32	5	5	5	15	2	5	5	5	17
15	Siswa	Wilidan061203@gmail.com		4	4	5	3	16	3	4	3	5	5	5	3	28	4	5	3	12	4	5	5	5	19
16	Siswa	Ovilia1602@gmail.com		4	4	5	4	17	5	4	4	4	5	5	5	32	4	5	5	14	4	4	5	4	17
17	Siswa	aldifahmi337@gmail.com		4	4	4	4	16	4	4	5	4	4	5	4	30	4	5	5	14	4	4	4	4	16
18	Siswa	anggrahmi27@gmail.com		4	5	4	4	17	5	5	4	4	4	4	4	30	4	5	5	14	4	5	4	4	17
19	Siswa	widhyafesatabinna07@gmail.com		5	5	5	5	20	5	5	5	5	5	5	5	35	5	5	5	15	5	5	5	5	20
20	Siswa	azahraatik19@gmail.com		5	5	5	5	20	5	5	5	5	5	5	5	35	5	4	5	14	5	5	5	5	20
21	Siswa	iqornatur08@gmail.com		4	5	4	3	16	5	5	4	5	4	5	4	32	4	4	5	13	5	5	4	5	19
22	Siswa	Sisqa@gmail.com		4	5	4	4	17	4	4	4	4	4	5	4	29	4	4	5	13	5	5	5	5	20
23								363								628				277					369
24			Total Tertinggi*Jml Responden					400								700				300					400
25			Jumlah Skor Responden/Total Tertinggi*Jml Responden*100					90.75								89.71428571				92.3333333					92.25

Figure 8. Research Data Results Table

Based on the table above, the results of material validation from augmented reality-based learning media by the two validators are known to get a value with an average percentage for the value of the two validators of 90.75% with the "very valid" category to be used as learning media based on the media validation category table.

Based on the results of user tests by several students who are learning about photography, it can be seen that the average assessment results if calculated by percentage, the media gets a score of 90.63% which is categorized as "very valid" based on practicality. media category table, which will be used as learning media. The media and material display indicators of the applications made show a number of 89.7%, with the "very valid" category,

for the software indicator it shows 92.33% in the "very valid" category, and shows 92.25% in the "very valid" category. " for the benefit indicator. So from the results of student responses it can be seen that students are interested in using Augmented Reality-based learning media.

Results of the Validation of the Syllabus

The summary of the results of the syllabus component validation analysis is presented in Table 2.

Table 2. Validation Result from the Syllabus Component

No	Rated aspect			Total Score	Criteria
	Format	Language	Contents		
1	15%	25%	50%	90%	Very Worthy

All of the syllabus validation component validity criteria under Table 2 meet very worthy criteria. The syllabus is a subject-based learning plan that includes competency criteria, core competencies, subject learning, learning activities, competency success indicators for assessment, assessments, time allocation, and learning resources (Kasni, 2021); Aguss et al., 2021).

Results of the Validation of the Lesson Plan

The summary of the results of the lesson plan component validation analysis is presented in Table 3.

Table 3. Validation Result from the Lesson Plan Component

No	Rated aspect			Total Score	Criteria
	Format	Language	Contents		
1	30%	20%	35%	85%	Very Worthy

Based on Table 3, the lesson plan validation components' validity all meet the very worthy criteria. Learning plans are developed based on RPP and syllabus that have been prepared with the aim of achieving the expected learning outcomes (Djuwairiah Ahmad, 2016).

Conclusion

This research has succeeded in developing learning media based on augmented reality on the introduction of lenses and cameras for class XI students using the ADDIE model. In accordance with the ADDIE procedure, this development has carried out all the existing stages. Based on the assessment by media experts, material experts and questionnaires on small and large class student trials, it can be concluded that the learning media that the researchers have developed are in the very feasible category to use.

Recommendation

Further research can be carried out by researchers and educators to test the practicality and effectiveness of photography learning tools to increase students' knowledge. Innovations carried out using Augmented Reality are expected to be able to be a solution in solving problems in learning at each school that holds practicums carried out during this pandemic, especially in class XI Multimedia Vocational Schools on practicum-based subjects in general.



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