

Flashcard Learning Media Development Based on Augmented Reality for Elementary School Children

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Abstract: *This study uses a 4D development research model which consists of 4 stages of development. The first stage is definition, the second stage is design, the third stage is development, and the fourth stage is dissemination. Each stage of the development also has several stages in it. The stages are (1) student analysis, (2) curriculum analysis, (3) material analysis, (4) media selection, (5) format selection, (6) make an initial design according to the selected material format, (7) product development (manufacture, validation, revision, trial), (8) dissemination. However, in this study only up to the development stage. The dissemination or dissemination stage can be carried out after this research. The feasibility of flashcard learning media was tested using the validity test of media experts and material experts. The results of the test show the number 88.04, which means that it is in the range of 81-100 and is classified as very feasible. The effectiveness of flashcard learning media can be seen from the results of student learning tests and student response questionnaires. Based on the analysis of these data, showing the number 79.2. Based on the criteria for student learning outcomes, the percentage results are in the range of 71 – 80.99 and show the effective criteria. These criteria indicate that the learning media developed are ready to be used in the field but are allowed to add something that is felt to be lacking.*

Keywords: learning media, traditional house, flashcard, effective

Introduction

Education is the gateway for the nation's next generation to form superior personalities, both individually and in groups. Social Studies education, Indonesian Language and Civics is one of the basic of education which is a compulsory subject in elementary schools (SD). However, in some cases, students tend to feel bored and lose interest in learning. Students will easily get bored and lose interest in the learning delivered by the teacher due to several factors. One of the factors that affect the enthusiasm of students in participating in learning is the learning media. The learning media is one of the most important aspects in the learning process.

The learning media is a teacher intermediary in providing material to students. The term media comes from Latin which is the plural form of "medium" which literally means intermediary or introduction. The general meaning is something that serves to show information from the source to the recipient of the information. Learning media is one of the most important components in the teaching and learning process. The teaching and learning process has a broader meaning and meaning than the notion of teaching. In the learning process, there is a unity of activity that cannot be separated between students who learn and teachers who teach. There is a mutually supportive interaction between the two activities (Depdiknas, 2003).

Learning media is used to support the learning process. However, there are still teachers who are still not optimal in implementing learning media. Learning that is still relatively minimal in the use of media is social studies education. Whereas social studies are one of the subjects that must be included in the primary and secondary education

curriculum (UU Sisdiknas Article 37, 2017). In 1993 the National Council for the Social Studies (NCSS) issued the following official definition of social science. Social studies are the integrated study of the study sciences and humanities to promote civic competence. Within the school program, social studies provide coordinate, systematic study drawing upon such discipline as anthropology, archaeology, economics, geography, history, law, philosophy, political science, psychology, religion, and sociology, as well as appropriate content from the humanities, mathematics, and natural sciences. The primary purpose of social studies is to help young people develop the ability to make informed and reasoned decisions for the public good as citizens of culturally diverse, democratic society in an interdependent world (Sapriya, 2017:10).

There is a tendency to misunderstand that social studies are lesson that requires memorization. This kind of understanding leads us as teachers to place more emphasis on verbalism learning. In particular, the content of history learning is very lacking in terms of learning media. Most of the existing learning media are based on two-dimensional images and short stories. This makes students easily bored and learning becomes less varied. This is where the challenge for teachers to develop teaching media.

Social studies education is one of the lessons that is still minimal in the use of teaching media as stated above. In addition, the old way or conventional learning media such as learning books or two-dimensional (2D) pictures of course result in students getting bored and bored in learning. In social studies education learning for elementary school students there is material that discusses the diversity of traditional

houses in Indonesia. The material examines the various types of traditional houses in Indonesia, ranging from the shape, materials of manufacture, uniqueness and origin of the traditional house. In the Class 4 Sub-theme 2 Student Book, there are learning activities that require students to identify pictures of several traditional houses in Indonesia and with teacher guidance. The purpose of this activity is that students are expected to be able to find new knowledge about the area of origin of traditional houses and their uniqueness. Students will better understand and achieve learning objectives when using appropriate learning techniques and teaching tools. In indirect observation during learning, it was found that there were problems with student interest in social studies learning, especially traditional house subjects. This is because the teacher has not utilized the media optimally in the learning process.

Along with the development and advancement of science and technology, learning media has also experienced many developments. Advances in information and technology have an impact on education, one of which is the release of various technology-based learning media used by teachers to serve as learning tools to improve student understanding (Editya, 2014).

In this era of globalization and industrial revolution 4.0, the use of information technology-based media is a demand and challenge for educators. Through the development and advancement of this technology, it is hoped that it can provide new changes and innovations in terms of learning media. Many types of information technology-based learning media are often used, such as e-books, learning videos, power points, virtual laboratories, virtual reality and augmented reality. For this reason, researchers want to develop information technology-based learning media, namely augmented reality -based learning media which contains pictures of traditional houses and their supporting descriptions. The purpose of developing this media is so that students can have a clear and concrete picture of the shape, uniqueness, characteristics and regional origin of the traditional houses displayed in the media.

Augmented Reality (AR) -based learning media is a set of technology-based learning that uses the incorporation of three-dimensional (3D) objects into the real-world environment to form virtual objects which are then projected directly using a smartphone (Carmigniani, 2011).

The advantage of using Augmented Reality (AR) teaching media is that students can see visual displays that are packaged in an attractive way for elementary school students, because they can display real 3D objects through smartphone screens so that they can increase students' interest in learning and can realize effective learning for students and teachers. This augmented reality-based learning media uses a tool that is very familiar to students, namely smartphones. This augmented reality-based media uses markers in its system. A marker or commonly called a marker is a pattern or code that has been integrated with augmented reality like a barcode system and detected by the camera of a smartphone. One of the markers that can be

used to develop augmented reality -based learning media is flashcards. Flashcards are graphic media that contain images, text, signs or symbols that can later display a 3D (three-dimensional) model after being read by a student's smartphone.

There are several studies on which researchers want to make learning media based on augmented reality. First, namely the research conducted by Yulia Khusnul Hamidiyah who was appointed in the journal PGSD FIP, Universitas Negeri Surabaya which stated that augmented reality -based learning media was feasible to use in learning. However, based on research on the development of augmented reality -based learning media, research still needs to be done regarding the effectiveness of these media using actual classes.

Second, the journal entitled Development of 3D Solar System Interactive Learning Media Applications Using Augmented Reality Technology with Android by Nanda Juanda Dipura Atmaja in the journal SEMNASTEK Universitas Majalengka. The results of this study suggest that augmented reality -based learning media really makes students and teachers effective and good when carrying out the learning process.

Researchers want to raise and examine this problem because in the PGSD study program at Universitas Jember, no one has studied the development of augmented reality-based media. Seeing the background of the problem, the researchers focused more on examining the problem by realizing a research entitled "Development of Augmented Reality - Based Flashcard Learning Media in Class 4 Theme 7 Sub-theme 2 Main Discussion of Traditional Houses".

Reviewing the background description above, the problem formulation can be obtained as follows: (1) How is the process of developing augmented reality -based flashcard learning media in grade 4, theme 7, sub-theme 2, the subject of traditional houses? (2) How are the results of the feasibility test for the augmented reality -based flashcard learning media in grade 4, theme 7, sub-theme 2, the subject of traditional houses? (3) How is the effectiveness of augmented reality -based flashcard learning media in grade 4, theme 7, sub-theme 2, the subject of traditional houses?.

Reviewing the formulation of the problem, it can be seen that the objectives of this research are as follows : to find out the process of developing augmented reality -based flashcard learning media in grade 4, theme 7, sub-theme 2, the subject of traditional houses , to find out the results of the validity test of the feasibility of augmented -based flashcard learning media reality in grade 4, theme 7, sub-theme 2, the subject of house, and to analyze the effectiveness of the augmented reality -based flashcard learning media in grade 4, theme 7, sub-theme 2, the subject of traditional houses.

Research Methods

The type of research used in this research is the type of research and development. (Masyhud, 2021) explains that research for development is a process used by researchers to share and validate educational products

(models, approaches, modules or learning media). This type of research is also known as " Research Based Development ".

The research design used in this study is the 4D development research model. Mulyatiningsih (2014) revealed that the 4D model stands for Definition, Design, Development, and Dissemination. The stages or activities carried out in this 4D model are as follows: (1) Definition, this defining activity is carried out to determine and define development conditions. In another example, this term is often This is called needs analysis. Each exclusive product requires a different analysis. 2) Design (design), this design activity is carried out starting from media selection, material format selection, making initial designs according to the selected format. (3) Development, at this stage product development is carried out in collaboration with experts in the field of augmented reality . After the product has been successfully made and has gone through a process of revision and expert assessment, the product is tested on a limited basis in the class that is the subject of research. At this stage it is also to evaluate whether the augmented reality -based learning media that has been developed is feasible and effective to use on a wider scale. This evaluation is carried out by validators (experts). (4) Dissemination , at this stage the learning media that has been developed and through a validation process are used in the classroom and in other schools.

Before doing research, the product goes through a validation process first, namely validation of media experts and validation of material experts. The validation results were then analyzed using the following formula.

$$\text{Valpro} = \frac{\text{srt}}{\text{smt}} \times 100$$

Information:

Valpro = Validity product

srt = Real score achieved (mean of validators)

smt = Maximum score can be achieved

Source: (Masyhud, 2021:260-261)

Then to determine the effectiveness of the developed learning media, using the analysis of student learning outcomes tests and student response questionnaires with the following formula.

$$\text{Percentage of student responses} = \frac{\text{TSe}}{\text{TSh}} \times 100\%$$

Information:

TSe = Total empirical score

TSh = Total maximum score

Source: (Akbar, 2017)

$$E = \frac{n}{N} \times 100\%$$

Information:

E = Percentage of classical learning completeness

n = Number of students who finished studying

N = Total number of students

Research Result

This study uses a 4D development research model which consists of 4 stages of development. The first stage is

definition, the second stage is design, the third stage is development, and the fourth stage is dissemination. Each stage of the development also has several stages in it. The stages are (1) student analysis , (2) curriculum analysis, (3) material analysis, (4) media selection, (5)format selection, (6) make an initial design according to the selected material format, (7) product development (manufacture, validation, revision, trial), (8) dissemination. However, in this study only up to the development stage. The dissemination or dissemination stage can be carried out after this research.

Testing the feasibility of this augmented reality -based flashcard learning media with a product validity test. The validation here uses media expert validators and material experts. Media expert validators are PGSD lecturers at Universitas Jember (Kendid Mahmudi S.Pd, M.Pfis. and Fajar Surya Hutama S.Pd., M.Pd.). The material expert validator is the PGSD lecturer at Universitas Jember (Fajar Surya Hutama S.Pd., M.Pd.). To test the effectiveness of the augmented reality -based flashcard learning media, a trial was used using student learning outcomes test questions. The learning outcomes test used is a test with objective questions. There are 30 questions in the form of multiple choice with ability levels from C1 to C4.

This research took place at SDN Tegal Besar 01 and was carried out in the second semester of the 2021/2022 academic year. The class used is grade 4 as many as 26 students. The implementation of the research that has been carried out is as follows:

Table 4.1 Research Schedule

No.	Day	Date	Information
1.	Monday	18 April 2022	Material Validation by Validator 1
2.	Monday	18 April 2022	Media Validation by Validator 1
3.	Tuesday	26 April 2022	Material Validation by Validator 2
4.	Tuesday	26 April 2022	Media Validation by Validator 2
5.	Tuesday	26 April 2022	Instrument Validation
6.	Thursday	30 April 2022	Research Permit in School
7.	Monday	16 May 2022	Product trial
8.	Monday	16 May 2022	Post-test work
9.	Monday	16 May 2022	Filling out student response questionnaires

Development of augmented reality -based flashcard learning media with 4D development research procedures (Mulyatiningsih, 2014). This research procedure consists of 4 stages, namely definition, design, development, and disseminate. The stages are as follows: a student analysis, curriculum and material. The first stage in this research is the analysis of student needs, analysis of curriculum and materials in accordance with the research place. The analysis was carried out through initial

observations made on December 2021. Data collection techniques in this initial observation were interviews with teachers and distributing questionnaires to students. Material analysis was also carried out by looking at the presentation of the material contained in student books and teacher books. Based on this analysis, it was found that the 4th grade students needed media to explain the material on cultural diversity in Indonesia. The second stage is media selection, the media used in this study is flashcard media . augmented reality based. The selection of this media was because during interviews and analysis of student needs it was found that teachers and students had never received technology-based media. The selection of this media also takes into account the material that we will use later. The fourth stage is the selection of the material format, the format of the material used is adjusted to the student's book and then compiled on the developed media. The media format uses traditional house flashcards which will later display material about cultural diversity in Indonesia through a smartphone application. The fifth stage is to make an initial design according to the selected material format, the initial draft is made according to the selected material format. The material selected in this flashcard learning media is material about traditional houses. There are 5 traditional houses that are made into card shapes and then make a minimalist container design for the card. The sixth stage is product development (manufacture, validation, revision, testing). This product development stage includes the process of making flashcards and augmented reality -based android-applications. In addition, at this stage validation, revision and product testing are also carried out.

1. Design a custom house 3D object using the blender application.



3D Object Design Drawings with Blender Application

2. Custom house flashcard design



Flashcard Design Drawing with Canva App

3. Print flashcards



Image of The Result Of The Traditional House Flashcard Learning Media Products

4. Trial the traditional house application on a smartphone



Image of Application Display on Smartphone

5. Validation of augmented reality-based flashcard learning media products

Media expert validator: The media expert validator used by the researcher is Kendid Mahmudi S.Pd, M.Pfis. and Fajar Surya Hutama, S.Pd., M.Pd., he is a lecturer in the Elementary School Teacher Education study program, FKIP Universitas Jember. The results of the product validity of media experts use the following formula:

Validator 1 (Kendid Mahmudi S.Pd, M.Pfis.)

$$\text{Valpro} = \frac{\text{srt}}{\text{smt}} \times 100$$

$$\text{Valpro} = \frac{95}{100} \times 100$$

$$\text{Valpro} = 95$$

$$\text{Valpro} = 95$$

The results of the product validity show the number 95, which means it is in the range of 81 - 100 with the validation results criteria classified as very feasible. The follow-up to the validation results is that the media is ready to be used in learning activities. However, there are still some suggestions from the validator to be improved so that the media is effectively used in the field.

Validator 2 (Fajar Surya Hutama, S.Pd., M.Pd.)

$$\text{Valpro} = \frac{\text{srt}}{\text{smt}} \times 100$$

$$\text{Valpro} = \frac{90}{100} \times 100$$

$$\text{Valpro} = 90$$

The results of the product validity show the number 90, which means that it is in the range of 81 - 100 with the validation results criteria classified as very feasible. The follow-up to the validation results is that the media is ready to be used in learning activities. However, there are still some suggestions from the validator to be improved so that the media is effectively used in the field.

Material expert validator: The material expert validator used by the researcher is Fajar Surya Hutama, S.Pd., M.Pd, he is a lecturer in the Elementary School Teacher Education study program, FKIP Universitas Jember. The results of the product validity of material experts use the following formula:

$$\text{Valpro} = \frac{\text{srt}}{\text{smt}} \times 100$$

$$\text{Valpro} = \frac{57}{72} \times 100$$

$$\text{Valpro} = 79,12$$

The results of the product validity show the number 79.12 which means it is in the range of 61 - 80.99 with the validation results criteria classified as feasible. Therefore, the

material in the learning media may or may not be revised, according to the advice of the validator. At this time the material expert validation did not ask for revision, so the material in this media was appropriate and appropriate.

The conclusion from the validation above is that the average product validity is 88.04, which means it is in the range of 81 – 100 and is classified as very feasible. Therefore, the learning media products can be used in learning activities

6. Product Revision

This product revision stage is used to improve the learning media in accordance with the suggestions from each validator.

7. Student Response Questionnaire

Table of Students Response Questionnaire Results analysis

Aspects	Percentage (%)	Categories
Enjoyment	97%	Very good
Understanding	74%	Well
Helping students	98%	Very good
Material Convenience	94%	Very good
Development	94%	Very good
Attractiveness	95%	Very good
Practicality	93%	Very good
Material Clarity	94%	Very good
Media Ease	98%	Very good
Mean	93,67%	Very good

The results of the student response questionnaire from the product field trial were analyzed using a formula according to data analysis techniques. The results of the analysis showed a percentage of 93.67. Based on the criteria for the results of the student response questionnaire, the percentage results show very good criteria. These criteria indicate that the learning media developed are ready to be used in the field without making revisions.

Student Learning Outcomes Analysis Table

No.	Student's name	Score
1.	Ahmad Aliridoih Farisih	53
2.	Ahmad Hilman Huda	80
3.	Aisyah Alyatsani Yuniar	100
4.	Ajeng Widyaningrum	90
5.	Alvian Ramadani	93
6.	Cinta Ramadani	87
7.	Dovi Faturrohman	93
8.	Faizah Lailin Nisa	57
9.	Gishelle Zaskya Syaharani	80
10.	Kamila Hajarul Aswadita	93
11.	Lukman Hakim	43
12.	Meli Dwita Lestari	77
13.	Moch Irzaq Muqorrobin	93
14.	Muhamad Fikri Hidayah	90
15.	Muhammad Dzakwan Haady Kuswanto	87
16.	Nabilatus Nafsiah	83
17.	Rendi Dwi Saputra	87
18.	Rizqi Aditya Prayogi	50

No.	Student's name	Score
19.	Romi Rahmatullah	50
20.	Sayiddan Zulvia	87
21.	Shifa Aurelia Salsabila	70
22.	Silfina Agustina	77
23.	Siti Nurul Ayni	77
24.	Tirta Surya Ainur Riski	93
25.	Wildan Ubaidilah	90
Total		1980
Percentage of Complete Learning		79,2%

Effectiveness Category

Effective

Student learning outcomes from product field trials were analyzed using formulas according to data analysis techniques. The results of the analysis showed a percentage of 79.2. Based on the criteria for student learning outcomes, the percentage results are in the range of 71 – 80.99 and show the effective criteria. These criteria indicate that the learning media developed are ready to be used in the field but are allowed to add something that is felt to be lacking.

Discussion

Development of augmented reality - based flashcard learning media that has been developed using a 4D development model. The media developed is media with a focus on traditional house materials contained in Theme 7 The Beauty of Cultural Diversity in My Country. According to the development research model used, this research uses 4 stages. However, this research uses only 3 stages, because the dissemination stage will be carried out after the research process if possible.

The first stage is definition, the methods used in this definition stage are interviews and questionnaires. The results of the analysis indicate that there is a need for innovation related to learning media used by teachers so that students do not get bored easily. The second stage is design, at this stage the product development process begins with the help of development experts. The third stage is development, in this process validation of media and material experts, revision and testing is carried out. Results from the validation above, the average product validity is 88.04, which means it is in the range of 81 - 100 and is classified as very feasible. Therefore, these learning media products can be used in learning activities without revision. The trial was carried out after the validation and revision process in the actual class. The results of the student learning test in the trial showed the number 79.2. Based on the criteria for student learning outcomes, the percentage results are in the range of 71 – 80.99 and show the effective criteria. These criteria indicate that the learning media developed are ready to be used in the field but are allowed to add something that is felt to be lacking. After doing the trial and post-test, students were asked to fill out a response questionnaire after learning using flashcard media that had been developed. Students were enthusiastic during the lesson using the flashcard media.

Based on the results of the feasibility test, it can be categorized that this augmented reality -based flashcard learning media is very feasible and can be used in actual classroom learning. Based on the results of the analysis of student learning tests and student response questionnaires, this augmented reality -based flashcard learning media is classified as very effective and good. This is also supported by the results of direct observations by the 4th grade teacher when the media was tested in fourth grade at SDN Tegal Besar 01, Jember Regency directly. Based on the literature review in chapter 2, the advantages and disadvantages of augmented reality-based learning media are also explained. A significant obstacle during the trial was the process of installing applications on students' smartphones which took a long time to disrupt the learning process. The solution to this problem is to install the H-1 learning application first. The advantage of using this media is that it attracts the attention of students, so that students are more focused in participating in learning in class. Interesting learning media can also improve student learning outcomes.

There are differences in this study with previous studies, where in previous studies the effectiveness of learning media was very low. However, in this study it can be categorized as very effective and feasible to use. There are several obstacles in the research that may be improved by future researchers.

Based on the results of the overall analysis, it can be concluded that the feasibility of augmented reality -based flashcard learning media in grade 4, theme 7, sub-theme 2, the subject of traditional houses, shows the number 88.04, which means it is in the range of 81-100 and is classified as very feasible. While the effectiveness of the augmented reality -based flashcard learning media in grade 4, theme 7, sub-theme 2, the subject of traditional houses, shows the number 79.2. Based on the criteria for student learning outcomes, the percentage results are in the range of 71 – 80.99 and show the effective criteria. These criteria indicate that the learning media developed are ready to be used in the field but are allowed to add something that is felt to be lacking.

Conclusions and Recommendations

Based on the process of developing augmented reality -based flashcard learning media in grade 4 theme 7 sub-theme 2, the subject of traditional houses, it can be concluded that the development of augmented reality -based flashcard learning media in grade 4, theme 7, sub-theme 2, the subject of traditional houses, uses a 4D development model (definition, design, development and dissemination), but in this study only used 3 stages, namely to the development stage. The place where this research was carried out was at SDN Tegal Besar 01, Jember Regency. The development process begins in the even semester of the 2021/2022 academic year, precisely on Monday, April 18, 2022 to Monday, May 16, 2022. The feasibility of augmented reality -based flashcard learning media in grade 4, theme 7,

sub-theme 2, subject matter of traditional houses, was tested using the validity of media experts and material experts. The results of the test show the number 88.04, which means that it is in the range of 81-100 and is classified as very feasible. The effectiveness of augmented reality -based flashcard learning media in grade 4, theme 7, sub-theme 2, the subject of traditional houses can be seen from the results of student learning tests and student response questionnaires. Based on the analysis of these data, it shows the number 79.2. Based on the criteria for student learning outcomes, the percentage results are in the range of 71 – 80.99 and show the effective criteria. These criteria indicate that the learning media developed are ready to be used in the field but are allowed to add something that is felt to be lacking.

Based on the research that has been done, suggestions that can be given in this study for researchers are expected to be able to develop learning media with other materials and can be disseminated by uploading to the Playstore so that it can be used more widely. For teachers and students, augmented reality -based flashcard learning media in grade 4, theme 7, sub-theme 2, the subject of traditional houses, can be used as an alternative to interactive, innovative and information technology-based learning media. For other researchers, it is hoped that this research can be used as a reference and a relevant reference source..

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