

THE EFFECT OF THE USE OF AUGMENTED REALITY LEARNING MEDIA ON STUDENTS' LEARNING INTEREST IN MATHEMATICS LEARNING IN GRADE V AT STATE ELEMENTARY SCHOOL 1 DARMA

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Abstract. The purpose of this study is to obtain information about the effect of the use of Augmented Reality learning media on students' interest in learning mathematics in grade V in Elementary Schools, so that empirical information is obtained. A quantitative approach with Quasi Experimental Design with Nonequivalent Control Group Design was chosen as the method in this study. This method is used with an initial test (pretest) to determine the initial conditions, after which a final test (posttest) is given. After testing the hypothesis, the Paired Sample T Test obtained a sig. 0.001 < 0.05. These results indicate that there is a fairly good influence on the application of Augmented Reality learning media on students' interest in learning, thus indicating that H_a can be accepted. Meanwhile, to compare the differences in the results of students' interest in learning, the Independent Sample T Test obtained a sig. 0.015 < 0.05. And the obtained values of $t_{hitung} < t_{tabel}$ are $-10.80 < 2.002$ and $-10.70 < 2.002$ with a significance level of 0.5%. This shows that there is a difference between the application of Augmented Reality learning media and the application of conventional learning.

Keywords: Augmented Reality, Mathematics, Elementary School

Abstrak. Tujuan penelitian ini adalah untuk memperoleh informasi tentang pengaruh penggunaan media pembelajaran Augmented Reality terhadap minat belajar matematika siswa kelas V di Sekolah Dasar, sehingga diperoleh informasi empiris. Pendekatan kuantitatif dengan *Quasi Experimental Design* dengan *Nonequivalent Control Group Design* dipilih sebagai metode dalam penelitian ini. Metode ini digunakan dengan tes awal (*pretest*) untuk mengetahui kondisi awal, setelah itu diberikan tes akhir (*posttest*). Setelah dilakukan pengujian hipotesis, dengan Paired Sample T Test diperoleh nilai sig. 0,001 < 0,05. Hasil tersebut menunjukkan bahwa terdapat pengaruh yang cukup baik penerapan media pembelajaran *Augmented Reality* terhadap minat belajar siswa, dengan demikian menunjukkan bahwa H_a dapat diterima. Sedangkan untuk membandingkan perbedaan hasil minat belajar siswa, dengan Independent Sample T Test diperoleh nilai sig. 0,015 < 0,05. Dan diperoleh nilai $t_{hitung} < t_{tabel}$ sebesar $-10,80 < 2,002$ dan $-10,70 < 2,002$ dengan taraf signifikansi 0,5%. Hal ini menunjukkan bahwa terdapat perbedaan antara penerapan media pembelajaran Augmented Reality dengan penerapan media pembelajaran konvensional.

Kata Kunci: Realitas Tambah, Matematika, Sekolah Dasar

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INTRODUCTION

In mathematics learning, students are expected to understand mathematical concepts. However, many students still lack a strong grasp of mathematical concepts, and many dislike mathematics due to initial misunderstandings. Another factor is students who state that math problems are often difficult, requiring practical steps and requiring only written answers. Some students still struggle to grasp mathematical concepts. This is because most mathematical concepts are abstract and difficult for students to grasp, requiring mathematical skills to assist them in understanding them. The teaching and learning process in the classroom is inextricably linked to the media used by teachers to deliver the material. The more engaging the media used by teachers to deliver the material, supported by communicative delivery by teachers, the more engaged students will be in class.

The learning process in schools is constantly evolving, particularly in the use of technology in delivering learning materials. According to Mawati et al., (2023). Teachers will be burdened with the task of studying material and teaching many students, and not only that, educators are also required to be able to use currently developing technology, so it is possible that teachers will be less than optimal when providing learning. Thus, this will have an impact on decreasing student achievement and learning outcomes. The use of digital learning media is an influential part in assisting the learning process. Based on research conducted by Pradana (2020) states that in general, elementary school students have characteristics that like interesting images and enjoy using concrete objects, elementary school students are also smart in using smartphone technology, by using digital-based technology, learning will also be student-centered and can attract students' attention.

The word media itself comes from the Latin word *medius*, which literally means "middle" or "introduction." Learning media is a tool used by educators to convey information to students related to learning so that students easily understand it. In line with this, according to Arsyad (Muliyah et al., 2020) learning media is anything that can be used as a learning medium to provide information in learning activities so that it can arouse students' interest and passion while learning. Meanwhile, according to Adam and Syastra (Salwani and Ariani 2021) there are many types of learning media, both technical and physical, that are used during learning activities to provide assistance to teachers in conveying teaching materials to students so that learning objectives can be achieved.

Based on observations conducted by researchers in fifth-grade students of Darma 1 Elementary School, researchers found that several students appeared noisy and lazy due to a lack of interest in learning mathematics. Furthermore, the students were less active or

uninterested in the lessons they were participating in. Interviews with several students revealed that mathematics was very boring. They also stated that it was difficult, as it involved calculations and the memorization of formulas. Consequently, students' lack of interest in learning resulted in learning outcomes that did not meet the minimum completion criteria.

One characteristic of elementary school children is their enjoyment of using objects in the form of images of concrete objects, which is why teachers often use semi-concrete media in their teaching. One such media is Augmented Reality. According to Wulandari et al., (2023), the use of instructional media in the teaching and learning process can stimulate new desires and interests, as well as increase student motivation. One form of media that can be used as an aid in the learning process is visual media. Visual media is a medium that utilizes the sense of sight. The message to be conveyed is expressed through visual communication symbols. Along with the development of science and technology, various learning media utilizing information and communication technology (ICT) have emerged. One form of visual media that utilizes ICT systems is Augmented Reality (AR). Augmented Reality is an alternative intermediary that can be used as an appropriate visual medium for students.

Augmented Reality, or AR as it's commonly known, is a technology-based learning medium. Augmented reality technology is a breakthrough currently used in the field of interaction. This technology is very helpful in conveying information to users. Augmented Reality is an interaction technology that combines the real world and the virtual world. According to Ramadhan (Qorimah and Utama 2022), AR media is a technology that combines two- or three-dimensional objects in real time. Augmented Reality applications are unique because they can augment the user's reality. This is done visually by collaborating digitally with actual displays of the real world. Here, researchers will use an augmented reality application, namely Augmented Reality Bangun Ruang (Augmented Reality Bangun Ruang), offered by Aga Arsari, S.Kom. The application can be downloaded from Aga Arsari's YouTube channel or at <https://bit.ly/380gGRv>

Based on the above description of Augmented Reality-based learning media and previous research on this medium, it can be concluded that Augmented Reality-based learning media is expected to provide a solution to learning media problems and increase student learning interest. This study aims to determine the effect of using augmented reality learning media on student learning interest in fifth grade Mathematics at SD Negeri 1 Darma.

METHOD

In this study, the researcher chose a quantitative approach. Quantitative research is a research procedure that presents knowledge using numerical data as a tool to discover information about what is being studied. This study employed a quasi-experimental design. According to (William & Hita, 2020), the quasi-experimental method involves the use of methods and procedures to conduct observations in a study structured similar to an experiment. However, the conditions and experiences of the participants are less controlled because the study is limited to random assignment, including comparisons or control groups.

The experimental pattern used in this study was a pretest-posttest group research design. This method aims to test hypotheses about the causal relationship between the treatment and the changes resulting from the treatment. This study aimed to examine the effect of the use of Augmented Reality media on student learning interest in the experimental class. This study used an experimental method design to examine students' learning interest in mathematics through Augmented Reality learning media. The research design used was a Quasi-Experimental Design with a Nonequivalent Control Group Design. The design consisted of an experimental group and a control group.

Table 1. Experiment Design

Group	Pretest	Treatment	Posttest
Experiment	O ₁	X _E	O ₂
Control	O ₁	X _K	O ₂

Data collection techniques in this study included tests/questionnaires, observation, interviews, and documentation. The questionnaire was used to determine students' learning interests in the cognitive domain, obtained from pretest and posttest data in the form of mathematics learning interest scores. The subjects of this study were fifth-grade elementary school students at Darma 1 Elementary School, Darma District, Kuningan Regency, consisting of two study groups: study group A, the experimental class, and class group B, the control class, totaling 59 students.

Table 2. Sample of Experiment

No	Class	Student Amount
1	VA	29
2	VB	30
Amount		59

Sampling can be determined using a technique called sampling. Sampling is a technique used to determine the sample to be used in research. There are two types of sampling techniques: probability sampling and non-probability sampling. In this study, the researcher used non-probability sampling through purposive sampling. Purposive sampling is a sampling technique based on specific considerations.

The instrument in this study was the distribution of questionnaires to students. The questionnaire in this study aimed to obtain data on student responses to Augmented Reality learning media regarding interest in learning mathematics about spatial figures that had been developed. Respondents were given questions to answer. Indicators of learning interest were attention, feelings of pleasure or displeasure, awareness, and willingness. This interest was measured using a Likert scale.

Table 3. Grid of interest scale sheet

Dimensions	Indicator	Item Question
FeelingLike	Happy or No like with lesson	1
	Push participant educate present moment learning	2
	Feel bored And No Spirit Study	3
	Encourage students to be sincere withNo There is coercion in Study as well as Ready follow lesson	4
Attention in Learning	Participant educate notice or not notice explanation Teacher	5
	Educator give attention when give material lesson	6
	Educator give attention special to participant educate Which Not yet understand	7
	Do task Which given with Serious And not quite enough answer	8
Interest	Participant educate interested with material Matrix eye lesson Mathematics	9
	Students are interested in the teaching materials And media learning Which used educator	10
	Participant educate easy understand learning Which taught	11
	Students are interested in following the material learning Because interest on educator Which become idol	12
Involvementparticipant educate	Involvement participant educate active in discussion	13
	Involvement participant educate ask on Teacher during learning	14
	Involvement participant educate active in answer question from educator	15

The validity of the questions can be calculated using the point correlation formula. biserial, from the calculation results obtained using the formula is the validity coefficient or the validity number of the test item. And the validity test uses the help of *Statistical Product and Service Solutions (SPSS) for Windows* . The formula used by researchers to test validity is the *Pearson Correlation analysis technique* with the formula:

$$r_{xy} = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{\{N \sum X^2 - (\sum X)^2\}\{N \sum Y^2 - (\sum Y)^2\}}}$$

A questionnaire is declared valid if the r obtained from the calculation results (r_{xy}) is greater than the r *table value* with a significance level of 5%. The following is the validity of the instrument questions:

Table 4. Student learning interest questionnaire validation data

No	r count	r table	Information
1	0.674	0.374	Valid
2	0.602	0.374	Valid
3	-0.058	0.374	Not Valid
4	0.727	0.374	Valid
5	0.387	0.374	Valid
6	0.391	0.374	Valid
7	0.432	0.374	Valid
8	0.483	0.374	Valid
9	0.715	0.374	Valid
10	0.594	0.374	Valid
11	0.385	0.374	Valid
12	0.343	0.374	Not Valid
13	0.523	0.374	Valid
14	0.631	0.374	Valid
15	0.438	0.374	Valid

Validity testing criteria by comparing between r hitung (after being obtained from IBM SPSS) with r table Which based on on level significant 5% with n= 15 is 0.374 then if r count is greater than or equal to with r *tabel* so instrument it is said valid And even so on the contrary If r *hitung* more small from r *tabel* so instrument it is said No valid And instrument statement on study This Which No valid, No used again in this study.

Table 5. recapitulation results test validity questionnaire

Statistics	Question Items
Amount Question	15
Amount Student	28
Number Question Which Valid	1,2, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, And 15
Number Question Which No Valid	3 and 12
Amount Question Valid	13
<i>Presentation</i> Valid Questions(%)	80.7%

The reliability of a measure concerns the extent to which individual deviation scores, or z-scores, are relatively consistent when the same test or equivalent test is administered repeatedly. Reliability is one of the main characteristics of a good measurement instrument. The formula used is For test reliability in study This is use Cronbach's Alpha formula, namely:

$$r_{11} = \left[\frac{k}{(k-1)} \right] \left[1 - \frac{\sum \sigma^2 b}{\sigma^2 t} \right]$$

Information:

alpha reliability coefficient

k = number of question items

$\sum b^2 \sigma^2$ = number of item variants

t σ^2 = total variance.

Table 6. Realibility

Cronbach's Alpha	N of Items
.774	15

Based on results test reliability through application IBM SPSS 27, obtained value 0.774 If seen in the table reference reliability below, then level reliability instrument questionnaire study This classified as tall so that can measure interest Study student. According to (Sugiono, 2023) in study quantitative analysis data is activity after the data from all over respondents or other data sources collected. Activity in analysis data is grouping data based on variables from all over respondents, serve data each variables Which researched, do calculation For answer formulation problem, And do calculation For test hypothesis Which has submitted. Step next after instrument tested try is processed as well as analyzed with objective results Which obtained Can answer question researchers and for test hypothesis in research. Because data study is data quantitative, so technique analysis data using SPSS. Data analysis techniques used for test hypothesis in study This is with using the *t-sample test test*.

However before test phase *sample t-test*, prerequisite test is carried out namely the normality test and the homogeneity test For know is the data which is obtained normally distributed and has a homogeneous variance or no, until after that can tested the hypothesis.

RESULTS

This research was conducted at Darma 1 Public Elementary School with the aim of observing, implementing, and measuring the effect of Augmented Reality learning media on spatial geometry in fifth-grade Mathematics. The study involved two classes: an experimental class and a control class. In the experimental class, the researcher implemented Augmented Reality learning media, while in the control class, the researcher implemented conventional learning with a standard display using or utilizing objects around them.

The duration of this research was two months. The data collected was test data in the form of a questionnaire. The questionnaire questions underwent a series of feasibility tests, including testing with a material expert validator, validity testing, and reliability testing. Class VA was selected as the experimental class and Class VB as the control class. In this study, the researcher was directly involved in the observation process and teaching and learning activities in both the experimental and control classes. The homeroom teachers acted solely as facilitators.

Prior to the study, the researcher first observed the teaching and learning process in classes VA and VB. Based on the observations, students still felt bored and lacked interest during the lesson. Furthermore, some students do not read the material carefully and are busy chatting with their friends while the teacher is presenting the "Spatial Structures" topic in Mathematics. This will undoubtedly impact student learning outcomes and achievement due to a lack of interest in the subject. Therefore, a new idea is needed to address this issue, one of which is the use of Augmented Reality learning media.

Before administering the pre-test questionnaire to the experimental and control classes, the validity and reliability of the questionnaire, which will serve as the pre-test and post-test for the study, were first tested. This questionnaire was administered to sixth-grade students. Of the 15 statements, 13 were found to be valid and could be used for the pre-test and post-test in both the experimental and control classes. The results obtained after administering the pre-test to the two classes revealed a significant difference. The average score for the experimental class was 47.90, while the average score for the control class was 46.40.

In the first meeting, the researcher explained the research process to the students and then administered the pre-test. A pre-test was administered before the presentation of material using Augmented Reality learning media in the experimental class and conventional learning using

makeshift media using available objects in the control class. The purpose of the pre-test was to determine students' level of learning interest before the study began. The first meeting also served as an initial introduction and provided students with an apperception, ensuring a more effective and enjoyable learning process in subsequent stages.

In the second meeting, the researchers presented material on spatial structures using technology-based media, namely Augmented Reality. After a brief explanation of the material, students were asked to practice, discuss, and receive education on the use of the Augmented Reality application. Based on observations of student learning activities, students in the experimental class actively participated in assignments, provided opinions, and responded enthusiastically to the learning media.

In the third meeting, the researchers provided education on the Augmented Reality application. Based on observations of student learning activities, students were highly enthusiastic, directly involved in the use of the learning media, actively asked questions, and provided opinions and responses during class. Finally, a post-test was administered as a final question to measure students' level of learning interest after the Augmented Reality learning media was implemented. The learning process in the control class employed more conventional learning methods such as lectures, discussions, and question-and-answer sessions. During the lecture, a standard display was presented, designed to be as engaging as possible to facilitate student understanding. This was followed by a student-to-student discussion and Q&A session, followed by a quiz. Based on the researchers' observations, the class implementing Augmented Reality learning media tended to be more active and enthusiastic about learning compared to the class using only conventional learning. After the learning process was completed, a post-test was administered to the experimental and control classes. The average post-test score for the experimental class was 60.97.

DISCUSSION

The purpose of this study is to obtain information about the effect of the use of Augmented Reality learning media on the learning interest of fifth grade mathematics students in elementary schools, so that empirical information is obtained. A quantitative approach with Quasi Experimental Design with Nonequivalent Control Group Design was chosen as the method in this study. This method is used with an initial test (pretest) to determine the initial conditions, after which a final test (posttest) was given. The instrument used in this study was a questionnaire using a Likert scale given through pretest and posttest. This study was conducted in fifth grade of SD Negeri 1 Darma with a research sample of 60 students from

both fifth grades, class V A as an experimental class consisting of 13 boys and 16 girls. and class V B as a control class, consisting of 18 boys and 13 girls.

Data collection techniques in this study include interviews, observation, documentation and questionnaires. As well as using data analysis techniques in the form of normality tests, homogeneity tests and hypothesis tests. hypotheses to measure how much influence variable X has on variable Y and as a test of the research hypothesis put forward.

CONCLUSION

Based on the research results and a series of data analysis processes, it can be concluded that the application of Augmented Reality learning media has an impact on the learning interest of fifth-grade students at SD Negeri 1 Darma. This is evident from the average pre-test score of 47.90 for the experimental class and 46.40 for the control class. After the teaching and learning activities were carried out, the post-test results showed an average score of 60.97 for the experimental class and 46.40 for the control class. Based on these average scores, it can be concluded that the class implementing Augmented Reality learning media has a higher average score and has improved compared to the average score of the class implementing conventional learning with a regular display that utilizes or utilizes existing media.

Furthermore, after hypothesis testing using the Paired Sample T-Test, the result was significant at $0.001 < 0.05$. These results indicate that the application of Augmented Reality learning media has a positive effect on student learning interest, thus indicating that H_a is acceptable. Meanwhile, to compare the differences in the results of students' learning interests carried out using the Independent Sample T Test, the results obtained were sig. $0.015 < 0.05$. And the obtained values of $t_{hitung} < t_{tabel}$ were $-10.80 < 2.002$ and $-10.70 < 2.002$ with a significance level of 0.5%. This shows that there is a difference between the application of Augmented Reality learning media and the application of conventional learning.

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