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The Effect of Using Audiovisual Media on Students' Mathematics Learning Outcomes in Online Learning Supplements

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Abstract: This research aims to determine the effect of using audiovisual media on students' mathematics learning outcomes in online learning supplements. This type of research is experimental research. The population in this study were class VIII students, with the sample determined using random sampling techniques. The sample in this study consisted of 76 students, namely class VIII-A as the experimental class and class VIII-B students as the control class. The instrument used is a test of student learning outcomes. The data analysis used is the normality test and homogeneity test as a prerequisite test and the t test as a hypothesis test and effect size test to determine whether there is an influence from the use of audio-visual media on student learning outcomes. Based on the results of hypothesis testing using the t test, the significance level was obtained 5% obtained $t_{count} = 3{,}4599$ And $t_{table} = 1{,}666$ where these results show that $t_{count} > t_{table}$ so that H_0 rejected and H_a accepted. The effect size test results obtained a result of 0.804 which is in the high category, which means that there is an influence of the use of audio-visual media on students' mathematics learning outcomes in online learning supplements.

Keywords: audio-visual media, online learning, learning supplements

INTRODUCTION

Education is basically a process to help humans develop themselves so that they are able to face all changes and problems, with the aim of being able to develop well and optimize their full potential. In every learning process, of course the teacher hopes that what is taught can be conveyed well to students. So that after going through the learning process, there are changes or influences on the students. To see these changes or influences is through learning outcomes which are assessed from knowledge, attitudes and skills. Learning outcomes are changes in behavior as a result of the

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learning process (Husamah, Pantiwati, Restian, & Sumarsono, 2018). Learning outcomes are an assessment of student development and abilities related to mastery of the subject matter provided. To find out whether the learning outcomes achieved are in accordance with the desired objectives, an evaluation can be carried out.

Based on the data obtained from the mathematics learning results of class VIII students at SMPN 7 Mataram, there are still students whose scores are below the minimum completion criteria (KKM) set at 75. The percentage of student completion in each class is still below 50%. The lack of student learning outcomes can be caused by several factors both from within the student, such as the student's abilities, as well as from the environment, such as the less than optimal learning process due to insufficient class hours to discuss the subject matter (Laba, 2011).

The existence of technological developments that can be utilized in the learning process means that the learning process can be carried out anywhere and at any time. Like learning implemented during the previous pandemic, online learning can still be used for additional learning (learning supplement) for students to optimize the learning outcomes achieved by students. Like research conducted by Hasanah, Suyanto, & Suana (2016) where *e-learning* with *schoology* very interesting, easy, very useful and very effective to use as a learning supplement. However, this learning will of course be different from learning carried out in class because the teacher does not meet face to face. So there is a need for media to optimize the learning process. The aim of using media is to provide motivation to students and provide stimulation so that students can remember what they have learned (Hartatin, Arjudin, Kurniati, & Amrullah, 2021).

Media is an intermediary for conveying messages from the sender to the recipient of the message (Hamdani, 2011). When the message or information conveyed is in the form of an educational message or information, the media is included in educational media or learning media. According to Sanjaya (2012) learning media is everything and all activities that can increase knowledge, change attitudes and skills of everyone who uses it. Media selection must be in accordance with estimating the effectiveness of the media to be used. One of the media that can be used is audiovisual media.

Audiovisual media is a combination of audio and visual media that is created by oneself, such as slides combined with audio cassettes (Wingkel, 2004). In another opinion, audiovisual media is a type of media that contains sound elements and image elements that can be seen such as videos, films, sound slides, and so on (Sanjaya, 2012). The presence of sound and image elements allows students to receive learning messages through hearing as well as seeing visual images of the material being presented, so that students can better understand the material being provided. The use of audiovisual media in the form of videos can also attract students to learn. Apart from that, learning videos can also be played anywhere and at any time, and can also be replayed until students really understand the material provided (Azmi, Bachelor, Junaidi, Tyaningsih, & Wahidaturrahmi, 2021).

Based on observations made in the odd semester of the 2021/2022 academic year at SMPN 7 Mataram, it is known that during the online learning process, teachers use applications. *WhatsApp* And *Google Classroom*. *WhatsApp* is a cross-platform messaging application that allows us to exchange messages without credit, because *WhatsApp* using internet information packages

(Turmuzi, Hikmah, & Kurniawan, 2022). In its use *WhatsApp* can be used to send text messages, images, videos, and also to make calls so that it can help in establishing communication in all parts of the world (Kusuma & Hamidah, 2020). The learning process is carried out by the teacher sending learning modules to students to read and then working on the questions given. By using audiovisual media in the form of learning videos, you will be able to direct students' attention to concentrate on the lesson material and make it easier for students to understand the material provided.

The use of audiovisual media has been researched previously, such as research conducted by Prasetia (2016) concluding that there are differences in the average mathematics learning outcomes of students using audio-visual media. The average student learning outcomes using audio-visual media are significantly higher than the average student learning outcomes using conventional methods. Apart from that, the results of research conducted by Jusmiana & Herianto (2020) concluded that there is a positive and significant influence of the use of audio-visual media (video) on student learning outcomes. Both studies used audiovisual media as the main lesson in class, whereas in this study audiovisual media was used as a supplement outside of class hours at school. Therefore, this research aims to determine the effect of using audiovisual media on students' mathematics learning outcomes in online learning supplements.

METHOD

This type of research is quantitative research with an experimental research approach. According to Sugiyono (2013), experimental research is defined as a research method used to find the effect of certain treatments on other conditions under controlled conditions. The design of this research is to use a posttest form, only a control group with random subjects (*Randomized Subjects Posttest Only Control Group Design*). In this research design there are two groups, namely the experimental group and the control group. The experimental group is the group that is given treatment in the form of using audio-visual media, while the control group is the group that is not given treatment. The form of this research design can be described as in table 1 below.

Table 1. ***Randomized Subjects Posttest Only Control Group Design***

	Group	**Dependent Variable**	**Posts**
(R)	Experiment	X	AND_2
(R)	Control	-	AND_2

In this research there are two variables, namely the independent variable (*independent variable*) and the dependent variable (*dependent variable*). The independent variable in this research is audio-visual media, while the dependent variable in this research is learning outcomes. The population in this study were class VIII students. The sampling technique in this research is by *random sampling*. The samples taken in the research were two classes, namely class VIII-A as the experimental class and class VIII-B as the control class, each with 38 students. Data collection carried out in this research was by giving a test in the form of a final test (*posttest*).

The instrument used in this research was a test with descriptive questions. Before the instrument is given to students, a validity test is first carried out. Validity is the accuracy of a test regarding what is measured (Prayitno, 2019). The validity test used in this research is content validity with expert consideration. Next, to find out the results of content validity, the scores obtained from each validator are calculated using the Aiken formula.

Descriptive Statistical Analysis

Descriptive statistics are used to analyze data by describing or illustrating the data that has been collected as it is without making conclusions that apply to the general public (Sugiyono, 2013). The data that has been collected is described by calculating the ideal mean (M_i) and ideal standard deviation (Sb_i). Meanwhile, according to Sudijono (in Panie, Kurniati, Kurniawan, & Hikmah, 2023) student scores are categorized as in table 2 below.

Table 2. Categories of Student Learning Outcomes

Score	Category
$M_i + Sb_i \leq x$	High
$M_i - Sb_i \leq x < M_i + Sb_i$	Currently
$x < M_i - Sb_i$	Low

Information
x = Student value
Me = Mean ideal
Sbi = Ideal standard deviation
Me = 1/2 (highest score + lowest score)
Sbi = 1/6(highest score – lowest score)

Inferential Statistical Analysis

Data analysis is carried out to test the truth of a hypothesis. In this research, the data obtained from the experimental class and control class after carrying out the learning process is in the form of quantitative data. Hypothesis testing is carried out using the t test. Before carrying out the t test, prerequisite tests are carried out, namely the normality test and homogeneity test.

Prerequisite Test

The data normality test is carried out to determine whether the research data comes from a population that is normally distributed or not normally distributed. The normality test used is the test *Lilyfors* with the formula:

$$L_{max} = F(Day) - S(Zi) \quad (1)$$

Information:
L_{max} = largest absolute price
$F(Day)$ = standard number probability
$S(Zi)$ = proportion of standard numbers
With the testing criteria the data is normally distributed if $L_{max} < L_{table}$

The homogeneity test is carried out to determine whether the sample data was obtained from a population with homogeneous variance or not. The homogeneity test used is the F test with the formula:

$$F_{hthat's\ it} = \frac{large\ variance}{small\ variance} = \frac{(large\ standard\ deviation)^2}{(small\ standard\ deviation)^2} \quad (2)$$

$$F_{table} = F_{\alpha}\left(\frac{dk\ n_{large\ variance} - 1}{dk\ n_{small\ variance} - 1}\right) \quad (3)$$

With the testing criteria when $F_{count} < F_{table}$ for H_0 accepted.

Hypothesis Testing

The t test was carried out to test the differences between the two sample groups. This test was carried out to determine the effect of using audio-visual learning media on student learning outcomes. This t test uses the posttest results. The formula used for the t test is as follows.

$$t = \frac{\underline{x_1} - \underline{x_2}}{\sqrt{\frac{(n_1 - 1){s_1}^2 + (n_2 - 1){s_2}^2}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \quad (4)$$

$$t_{table} = t_{\alpha}(db = n_1 + n_2 - 2) \quad (5)$$

With the testing criteria when $-t_{table} \leq t_{count} \leq t_{table}$ for H_0 accepted.

Effect size according to Backer (in Panie et al, 2023) it is a way to measure the influence of a variable on other variables. To count *effect size* in the t test the formula is used *Cohen's* as follows.

$$d = \frac{\underline{x_t} - \underline{x_c}}{S_{polled}} \quad (6)$$

$$S_{polled} = \sqrt{\frac{(n_1 - 1){Sd_1}^2 + (n_2 - 1){Sd_2}^2}{n_1 + n_2}} \quad (7)$$

information

d = *Cohen's effect size*

$\underline{x_t}$ = experimental class average

$\underline{x_c}$ = control class average

S_{polled} = combined variance

n_1 = number of experimental class students

n_2 = number of control class students

${Sd_1}^2$ = experimental class variance

${Sd_2}^2$ = control class variance

Table 3. Value Interpretation Criteria *Cohen's*

Effect size	*Cohen's* Standard
$0.8 \leq IS \leq 2.0$	High
$0.5 \leq IS \leq 0.7$	Currently
$0.0 \leq IS \leq 0.4$	Low

Backer (dalam Lord et al, 2023)

RESULTS AND DISCUSSION

Results

Descriptive Statistical Analysis

To find out the results of mathematics learning, students were given a posttest in the form of essay questions after implementing additional learning using online audio-visual media in the experimental class and control class. The posttest results in the experimental class and control class can be seen in table 4.

Table 4. Posttest Results

	Experimental Class	Control Class
Many Students	38	38
The highest score	100	95
Lowest Value	60	55
Rate-rate	82,63	73,29

Next, to see the grade categories obtained by students, both experimental class and control class students, can be seen in table 5 below.

Table 5. Descriptive Analysis of Experimental Class Learning Results

Interval	Many Students	Category
$86{,}7 \leq x$	15	High
$73{,}3 \leq x < 86{,}7$	15	Currently
$x < 73{,}3$	8	Low

Table 6. Descriptive Analysis of Control Class Learning Results

Interval	Many Students	Category
$81{,}7 \leq x$	9	High
$68{,}3 \leq x < 81{,}7$	16	Currently
$x < 68{,}3$	13	Low

From table 6, it can be seen that there is a difference in the number of students who scored in the high category in the experimental class, namely 15 people, while in the control class there were only 9 people. This shows that learning completeness in the experimental class is higher than in the control class.

Inferential Statistical Analysis

Prerequisite Test

Normality Test

Test normality using the test *Lilyfors* The results are obtained in table 7 below.

Table 7. Posttest Data Normality Test Results

Class	$L_{hthatıs\ it}$	L_{table}	Conclusion
Experiment	0,140328	0,143728	Normally distributed
Control	0,108145	0,143728	Normally distributed

Based on table 7 it can be seen that $L_{hthatıs\ it} < L_{table}$, so it can be concluded that the data from both classes are normally distributed.

Homogeneity Test

The homogeneity test calculation was carried out using the F test and the results were obtained in table 8 below.

Table 8. Posttest Data Homogeneity Test Results

dk	S^2	$F_{hthatıs\ it}$	F_{table}	Conclusion
38	133,4282	1,076359	3,97	Homogeneous
38	143,6166			
76	277,0448			

Based on table 8 it can be seen that $F_{hthatıs\ it} < F_{table}$ at the significance level 5% so it can be concluded that the sample data is homogeneous.

Hypothesis Testing

After carrying out the prerequisite tests and the data is normally distributed and homogeneous, proceed with hypothesis testing using the t test. The results of the t test calculation can be seen in table 9 below.

Table 9. Hypothesis Test Results Posttest Data

Number of students	$\underline{x}$	S^2	$t_{hthatıs\ it}$	t_{table}	Conclusion
38	82,63	133,4282	3,4599	1,666	H_0 rejected
38	73,29	143,6166			

Based on table 9, the hypothesis test results obtained values $t_{hthatıs\ it} > t_{table}$ with a significance level 5%, so that H_0 rejected and H_a accepted, which means the average posttest score for the experimental class is greater than the average posttest score for the control class.

Test *Effect size*

Calculation *effect size* using the formula *Cohen's* Data obtained in table 10 below.

Table 10. Test Results *Effect size* Data Posttes

n_1	n_2	$\underline{x}_1$	$\underline{x}_2$	S_{polled}	d
38	38	82,63	73,29	11,614	0,804

Based on table 10, it can be seen that the test calculation results *effect size* with the formula *Cohen's* is 0.804 where the results are adjusted to the test interpretation criteria table *effect size* that the results are in the high category (have a high influence).

Discussion

After carrying out the post-test, the students' mathematics learning results on relations and functions material using audio-visual media in the experimental class obtained the highest score of 100 and the lowest 60 with an average of 82.63. Meanwhile, in the control class which did not use audio-visual media, the highest score was 95 and the lowest was 55 with an average of 73.29. In this case the average score of the experimental class has reached the KKM while the average score of the control class has not reached the KKM. This average difference shows the influence of the use of audio-visual media. This is in line with research by Jusmiana & Herianto (2020) which obtained an average result in the control class of 65.60 and the experimental class of 75.71 which concluded that there was a positive and significant influence of the use of audio-visual media (video) on mathematics learning outcomes. student.

Based on the percentage of completeness in the experimental class from initial data, it is 42.1% to 76.32% in the post-test results which means an increase of 34.22%. Meanwhile, the percentage of completeness in the control class from initial data was 34.2%%to 50% in the post-test results which means an increase of 15.8%. Based on this description, it can be seen that the use of audio-visual media has a positive influence on student learning outcomes. This can be seen from the increase in the percentage of student completion in the experimental class which is higher than in the control class. These results are in line with research conducted by Wahyudi, Suhartono, & Ngatman (2012) which concluded that the use of audio-visual media can improve mathematics learning outcomes as seen from an increase in student learning outcomes from 48.39% to 84.85% of students who achieved the KKM. .

This can also be seen from the activity of students in the experimental class who were more active when given exercises, as seen from the number of students who sent their answers. Meanwhile, in the control class, student activity was still less active, as seen from the fact that only five students submitted answers. These results are in accordance with the opinion of Prasetia (2016) that the positive impact of audio-visual media is that students are more enthusiastic and active in the learning process. Apart from that, according to Fitria (2014), audio-visual media, which is a combination of audio and visual, will be more complete and optimal to support learning activities, making it easier for students to learn.

After the post-test score data is obtained, prerequisite tests are carried out first, namely the normality test and homogeneity test. The normality test used is the test *Lilyfors* where the results obtained were that both classes had a normal distribution. Next, the homogeneity test was carried out using the F test, which showed that the two samples were homogeneous. After both classes have a normal distribution and are homogeneous, further analysis tests can be carried out. The hypothesis

test used is the t test and shows the results $t_{count} = 3{,}4598$ And $t_{table} = 1{,}666$ so that H_0 rejected and H_a accepted, which means there is a difference in the average posttest results between the experimental class and the control class. This difference in average shows that there is an influence from the use of audiovisual media given to the experimental class with an average of 82.63, where this value is greater than the average of the control class, namely 73.29. This can also be seen from the calculations *effect size* amounting to 0.804 which is in the high category, which means that the use of audiovisual media has a high influence on students' mathematics learning outcomes. The same thing was also shown by Purwono, Yutmini, & Anitah (2014) that there was an increase in student learning outcomes after using audio-visual media. So it can be concluded that there is an influence of the use of audiovisual media on student learning outcomes in online learning supplements.

CONCLUSION

Based on the research results and discussion, it can be concluded that the use of audio-visual media in online learning can improve student learning outcomes. From the results of hypothesis testing using the t test, it was found that a significance level of 5% was obtained $t_{count} = 3{,}4598$ And $t_{table} = 1{,}666$ where these results show that $t_{hthat's\ it} > t_{table}$ so that H_0 rejected and H_a accepted. Test results *effect size* got a result of 0.804 which is in the high category which means that there is an influence of the use of audiovisual media in online learning supplements on students' mathematics learning outcomes.

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