



The Effect of Use of Geogebra Media on Student Learning Result in Trigonometry Function Material in Class X Senior High School 8 Cirebon

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Abstract:

One of the causes of the unattractiveness of learning mathematics for high school is the complexity factor of learning media that is in harmony with complex material. Therefore, learning media need a form of presentation that is simple but attractive. Efforts to increase student interest, which requires a media to support learning mathematics. One of them is by using Geogebra learning media. This study aims to determine the influence of the use of learning media based on the Geogebra application on student learning outcomes at Senior High School 8 Cirebon. The research method used is a quasi-experimental design, which is a research method that has a control group, but cannot function fully to control external variables that affect the implementation of the experiment. The results of the study obtained the value of $F_{count} > F_{table}$ or $26,358 > 4,13$. And the correlation (r) = 0.661 then it is included in the medium category. The coefficient of determination (r^2) = 0.437 or 43.7%, then the learning media has an effect on student learning outcomes on the subject of trigonometric functions. Based on the results of the Independent T-test analysis, the t_{count} value of 11,037 using a significance level of 5% obtained t_{table} of 1,994. The t_{table} value is obtained from the excel program by means of $=tinv(0.05;69.)$ then enter. Because the value of $t_{count} > t_{table}$ ($11.037 > 1.994$) then H_0 is rejected. This means that Geogebra learning media can improve student learning outcomes.

Keywords: Geogebra, Learning Media, Learning Outcomes

A. Introduction

In the education sector, the development of information technology has penetrated the management system and also the learning system in the classroom. Effective learning is learning where the quality of the teacher in delivering the material varies in terms of teaching. One of the variations in teaching is by utilizing the media.

Media is something that conveys messages and can stimulate the thoughts, feelings, and desires of the audience (students) so that it can encourage the learning process in him. (Yaumi 2018). According to (Basyiruddin and Asnawir 2012), creative use of media or perhaps the audience (students) to learn better and can improve their performance in accordance with the goals to be achieved.

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Learning media is a stimulus tool used by educators that serves to convey learning messages. (Ritakumari 2019). Based on the classification, each learning media has its own characteristics (Darmawan 2020). These characteristics can be seen through the display of the media presented. Learning media is displayed according to the ability of the media to stimulate the senses of sight, hearing, tasting, and smelling. From these characteristics, the teacher can choose to use a learning media to adjust the learning situation. (Wati 2016).

One of the learning media that can be used to convey messages or mathematics learning materials is to use the Geogebra application. (Lengkong 2015). Geogebra is dynamic mathematics software that can be used as a tool in learning mathematics. (Linden 2020). When observed Geogebra can provide several advantages, namely Produce graphs quickly and accurately compared to using a pencil, ruler or compass, Provide a clearer visual experience for students in understanding mathematical concepts because it is equipped with animations and manipulation movements (dragging) and Used as evaluation to ensure that the paintings / graphics that have been made are correct; (Suryaningrum 2018)

The initial window display when opening the Geogebra application.



Figure 1. Geogebra preview

Information : Number 1 is the Geogebra menu consists of clear all, open, save, export image, share, options, help & feedback, exam mode. Next 2 is the Geogebra worksheet that displays a graph of an equation. Number 3 is the Settings menu consists of general, graphic display, algebra. And 4 is the Menu tool bar to use as a tool for working on graphics. Next 5 is the Field input bar, used as a place to input a function, point, line, etc. And then 6 is the Keyboard, to input numbers, letters, functions and symbols..

According to (Susyanto 2015), learning outcomes or achievements are the realization or expansion of a person's potential skills or capacities. Mastery of a person's learning outcomes can be seen from his behavior, both behavior in the form of knowledge, mastery, motor skills and thinking skills. (Hasanah 2017). Thus, education has a direction to change planned behavior through the teaching and learning process. Then the learning outcomes achieved must be in accordance with the

objectives of education. Humans have the potential for psychological behavior that can be educated and changed their behavior includes cognitive, psychomotor, and affective domains. (Ramli 2012)

Based on the results of observations made in class X SMA Negeri 8 Cirebon City, information was obtained that the percentage of students who scored above the KKM was 8% while students whose scores were below the KKM was 92%. From these results, it is known that the mathematics learning outcomes of students in class X are still low.

This is because the presentation of the material presented by the teacher still uses conventional methods (explaining the material on the blackboard) and is monotonous and boring, so students are less interested in learning mathematics. For this reason, a solution is needed so that all students feel part of the teaching and learning process. Given the importance of mathematics for education, it is necessary to find a solution that is a way of managing the learning process of mathematics so that mathematics can be digested well by students.

To deal with the above problems, a learning method is needed that can improve students' ability to solve mathematical problems. One of them is by utilizing developed technology, namely the Android version of the GeoGebra Application 5.0.533.0.

B. Methods

This type of research is a quasi-experimental design research, which is a research method that has a control group, but cannot function fully to control external variables that affect the implementation of the experiment. (Lestari and Yudhanegara 2017).

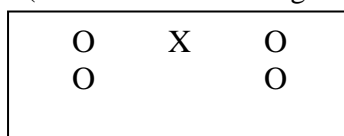


Figure 2. *Quasi eksperimental design*

Information : “X” is Treatment / treatment given and “O” is Pretest or Posttest

In this design there are two groups, the experimental group was given treatment in the form of learning mathematics using the Android version of the GeoGebra application 5.0.533.0 while the control group was not treated. Researchers will see the effect of using the GeoGebra application on learning mathematics in an effort to help understanding the material for class X Trigonometry Functions seen from student learning outcomes.

This research was conducted at High School 8 Cirebon, with the research subject being class X. The population in this study were students of class X Science Senior High School 8 Cirebon. The total population in this study was 309 students divided into 9 classes with the following number of students:

The samples taken in this study were students of class X Sciences 2 and students of class X Sciences 5. This sampling used the Probability Simple Random Sampling technique. This technique is the simplest sampling technique because the sampling of members of the population is carried out randomly without considering the strata in the population. (Jaya 2020)

Class X Sciences 2 is used as a control class, while class X Sciences 5 is used as an experimental class that receives trigonometric function learning using the Android version of the GeoGebra application 5.0.533.0.

Data collection techniques in this study were obtained by means of tests and questionnaires.

The data obtained by 2 test methods are pretest and posttest. The pretest was used to provide an overview of the students' initial abilities before the research was carried out or before the treatment was given, while the posttest was obtained from the tests held by the researcher after the treatment was given at the end of the study. (Yudhanegara, Lestari and Ridwan 2017). The test used in this study is a multiple choice form with a total of 25 questions.

Questionnaire is a list of questions given to other people who are willing to respond according to user requests. (Jaya 2020) The type of questionnaire used in this study is a combination questionnaire. This data was measured using a Likert Scale consisting of five alternative answers, namely Strongly Agree (SA), Agree (A), Doubtful (D), Disagree (DA), and Strongly Disagree (SD).

Table 1. Questionnaire Criteria

<i>NO</i>	<i>CRITERIA STATEMENT</i>	<i>SCORE</i>
<i>1</i>	<i>Strongly Agree (SA)</i>	<i>5</i>
<i>2</i>	<i>Agree (A)</i>	<i>4</i>
<i>3</i>	<i>Doubtful (D)</i>	<i>3</i>
<i>4</i>	<i>Disagree (DA)</i>	<i>2</i>
<i>5</i>	<i>Strongly Disagree (SD)</i>	<i>1</i>

(Marfani and Primawati 2017)

Then the data were analyzed descriptively quantitatively, namely calculating the average score using the following formula

$$P = \frac{\text{Jumlah skor}}{\text{Skor maksimal}} \times 100\%$$

The score will be used to determine the interpretation obtained from each measured aspect. Below is an interpretation of the questionnaire, which is as follows:

Table 2. Interpretation of the Questionnaire

<i>No</i>	<i>Percentage</i>	<i>Interpretation</i>
<i>1</i>	$90\% \leq P \leq 100\%$	<i>Very Good</i>
<i>2</i>	$75\% \leq P < 90\%$	<i>Good</i>

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3	$65\% \leq P < 75\%$	<i>Fairly Good</i>
4	$55\% \leq P < 65\%$	<i>Poor</i>
5	$0\% \leq P < 55\%$	<i>Very Poor</i>

(Hasan 2012)

The questionnaire that has been obtained is then calculated based on the formula below:

Table 3. Questionnaire Assessment

<i>Score</i>	<i>F</i>	<i>Total Score</i>	<i>Percentage</i>
<i>SA(5)</i>		<i>Total x F</i>	<i>Total score SA: total score x 100</i>
<i>A(4)</i>		<i>Total x F</i>	<i>Total score A: total score x 100</i>
<i>D(3)</i>		<i>Total x F</i>	<i>Total score D: total score x 100</i>
<i>DA(2)</i>		<i>Total x F</i>	<i>Total score DA: total score x 100</i>
<i>SD(1)</i>		<i>Total x F</i>	<i>Total score SD: total score x 100</i>
<i>Total</i>	<i>Total F</i>	<i>Total score</i>	<i>Total Percentage</i>
<i>Skor Maximum Score</i>	<i>5 x Total x Jml Number of items</i>		
<i>Percentage Average</i>	<i>Total Score: Score Maximum x 100</i>		
<i>Criteria</i>			

(Hartati, Darwan and Wahid 2020)

In this study there are two learning instruments is Implementation Plan Learning (RPP) and Geogebra Learning Module.

The Learning Implementation Plan (RPP) is a face-to-face learning activity plan for one or more meetings. This lesson plan is designed for 4 meetings with the total time for each meeting is 2x45 minutes.

Learning modules are self-study packages that are systematically arranged to facilitate the learning experience of students in order to achieve learning objectives. (Yaumi 2018) The Geogebra learning module is arranged in 4 meetings, and each meeting is given exercises so that students are able to master the material on trigonometric functions with Geogebra media.

Hypothesis testing in this study was carried out through statistical methods using regression analysis and t-test. Regression is a method to determine the causal relationship between one variable and another variable which is determined by the formula:

$$(Y) = a + bx,$$

Information :

"Y" = Subject in the predicted dependent variable

x = Subject in the independent variable that has a certain value

a = constant number of Unstandardized Coefficient

b = Number of linear regression coefficient

To find a and b use the formula:

$$a = \frac{\sum Y - b \sum X}{n}$$

$$b = \frac{n \sum XY - (\sum X)(\sum Y)}{n \sum X^2 - (\sum X)^2}$$

The t-test (Independent Sample T-Test) was conducted to determine the difference in the improvement of student learning outcomes between the control class with no media and the experimental class with Geogebra media. The T-Test (Independent Sample T-Test) in this study used the SPSS 21 program.

Prior to the regression analysis and t-test, the normality test and homogeneity test were conducted to determine whether the two samples came from a normally distributed population and to determine whether the two samples were homogeneous. If both conditions are met, then data analysis is carried out using regression analysis and t-test.

C. Findings and Discussion

Prior to the regression analysis and t-test, the normality test and homogeneity test were carried out as follows:

Table 4. Normality Test

Tests of Normality						
variable	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	f	Sig.	Statistic	df	Sig.
Experimental class	,129	36	,135	,974	36	,536
Control class	,144	35	,066	,948	35	,097

a. Lilliefors Significance Correction

Based on the results of the normality test with SPSS 21 obtained the value of Sig. students who use learning media based on the Geogebra application with the Kolmogorov-Smirnov and spiro-wilk tests, obtained (0.135 and 0.536) which are above 0.05. Dan Sig. students who did not use Geogebra application-based learning media were obtained (0.066 and 0.097). which is above 0.05. Thus, both sample data come from a normally distributed population.

Table 5. Homogeneity Test

Test of Homogeneity of Variance

Levene Statistic	df1	df2	Sig.
,705	1	69	,404

Based on the results of the homogeneity test, it is known that the value of Sig. students who use and do not use learning media based on the Geogebra application of 0.404 are above 0.05, it means that the data is homogeneously distributed.

After the two samples came from a normally distributed population and both samples were homogeneous, then regression analysis and t-test were performed.

Regression Analysis

Regression analysis is used to predict the relationship between the dependent variable and the independent variable. (Ramli 2012).

Table 6. Regression Coefficient Test

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-45,472	11,231		-4,049	,000
	Geogebra application-based learning media	1,048	,204	,661	5,134	,000

a. Dependent Variable: Improvement of learning outcomes

The table above shows the sig value is 0.000 (<0.05) and the t-test value is obtained with t count = 5.134 with degrees of freedom = n – 2 = 36 – 2 = 34 so that the t table is 1.69. Because the value of sig 0.000 <0.05 or ttable (1.69) tcount (5.134), it can be concluded that the value in column B is significant, meaning that the most appropriate equation for the two variables is:

$$Y = a + bX$$

$$Y = -45,472 + 1,048 X$$

With,

X = Geogebra application-based learning media

Y = Improved student learning outcomes

Improved student learning outcomes

= -45,472 + 1,048 Learning media based on Geogebra application.

The interpretation is:

Constant a = -45,472

This means that if the learning media based on the Geogebra application is 0, then the increase in student learning outcomes is -45.472.

Coefficient b = 1.048

This means that if the Geogebra application-based learning media is increased by 1 unit, the increase in student learning outcomes will increase by 1,048 units.

The Coefficient of Determination Test was conducted to determine the effect of the independent variable (learning media based on the Geogebra application) and the dependent (increasing student learning outcomes), and the following are the results of the analysis:

Table 7. Coefficient of Determination Test

Model Summary^b				
\Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,661 ^a	,437	,420	2,82093

a. Predictors: (Constant), Geogebra application-based learning media
Geogebra

b. Dependent Variable: increasing student learning outcomes

Based on the model summary table, it can be seen that R Square is 0.437 from the correlation coefficient (0.661). R-Square is called the coefficient of determination ($KD = r^2 \times 100\% = 0.661^2 \times 100\% = 43.7\%$) in this case 43.7%. The meaning of this value is that Geogebra application-based learning media affects the increase in student learning outcomes by 43.7%, and the remaining 56.3% is influenced by other factors.

Hypothesis:

Ha = The influence of Geogebra application-based learning media on improving student learning outcomes.

Ho = There is no influence of Geogebra application-based learning media on improving student learning outcomes.

T test criteria:

tcount ttable or -tcount -ttable, then Ho is accepted

tcount ttable or -tcount -ttable, then Ho is rejected

Criteria based on significance:

Significance or sig. > 0.05, then Ho is accepted

Significance or sig. < 0.05, then Ho is rejected

Based on the above test, the Geogebra application-based learning media variable has a p-Value value (in the sig. column) of 0.000. And $0.000 < \text{Level of significant } 0.05$, and ttable (1.69) tcount (5.134) which means significant. Significant here means that Ha is accepted and Ho is rejected, meaning that there is an influence of learning media based on the Geogebra application on improving student learning outcomes. This means that the learning media based on the Geogebra application is effective in increasing the learning outcomes of SMA Negeri 8 Cirebon students in the cognitive domain.

T test

To find out the difference in learning outcomes between students who use and do not use Geogebra application-based learning media at SMA Negeri 8 Cirebon, it is necessary to know some of the learning outcomes obtained by students who use and do not use Geogebra application-based learning media at SMA Negeri 8 Cirebon. In this study, two tests were conducted with the same questions, namely pretest and posttest.

Table 8. Description of Statistics

Descriptive Statistics						
	N	Mini mum	Maxi mum	Sum	Mean	Std. Deviation
Improving Experimental Class Learning Outcomes	36	3	19	437	12,138	3,70446
Improvement of Control Class Learning Outcomes	35	1	10	153	4,3714	1,92638
Valid N (listwise)	35					

Based on the results of the SPSS output on the value of increasing student learning outcomes in the experimental class, the minimum score is 3, the maximum value is 19, the average (mean) is 12.14, the standard deviation is 3.70, and the number is 437. the minimum value is 1, the maximum value is 10, the mean is 4.37, the standard deviation is 1.92, and the total is 153.

Table 9. T . test

Independent Samples Test	
Levene's Test for Equality of Variances	t-test for Equality of Means

		F	Sig.	t	df	Sig. (2- tailed)	Mean Differe nce	Std. Error Differe nce	95% Confidence Interval of the Difference	
									Lower	Upper
data peneliti an	Equal variances assumed	9,699	,003	11,0 37	69	,000	7,7674 6	,70376	6,3634 9	9,1714 3
	Equal variances not assumed			11,1 28	52,9 60	,000	7,7674 6	,69801	6,3674 0	9,1675 2

Based on the Independent Sample Test table, it is known that the significance value or Sig (2-tailed) on the equal variance not assumed is 0.000. When compared, the value will be smaller than 0.05 ($0.000 < 0.05$), this means that H_0 is rejected which indicates that there are differences in learning outcomes between students who use and do not use Geogebra application-based learning media at SMA Negeri 8 Cirebon. .

D. Conclusion

The effect of using Geogebra media on student learning outcomes in class X SMA Negeri 8 Cirebon shows a strong category effect. This is based on the regression test using the SPSS.21 program in chapter IV above, the t test value is obtained with t count = 5.134 with degrees of freedom = $n - 2 = 36 - 2 = 34$ so that the t table is 1.69. Because the value of sig $0.000 < 0.05$ or ttable (1.69) tcount (5.134). And the correlation (r) = 0.661 then it is included in the strong category. The coefficient of determination (r^2) = 0.437 or 43.7% indicates that there is an influence of learning media on student learning outcomes on the subject of trigonometric functions.

Based on the results of the Independent T-test analysis, the t-count value of 11.037 using a significance level of 5% obtained t-table of 1.9949. The ttable value is obtained from the excel program by means of =tinv(0.05;69) then enter. So that the value of tcount > ttable then H_0 is rejected. This means that Geogebra learning media can improve student learning outcomes. From the descriptive table, it can be seen that the average score of students who study using Geogebra media is 12.138. And the average score of students who do not use Geogebra media is 4.37. It also shows that the learning outcomes of students who use Geogebra learning media are higher than students who do not use Geogebra media.

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