

Effectiveness of Geogebra Learning With Scientific Approach To Vocational School of Technical Engineering 2 Binjai

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Abstract. 21st Century is known as the era of the information society, this can be seen from the emergence of the phenomenon of digital society. So we know the term industrial revolution 4.0. The industrial revolution 4.0 has an impact in the world of education in Indonesia, known as 21st-century learning, which is technology-based learning and requires students to be the center of learning. This is in line with the 2013 curriculum which applies a scientific approach. One of the software that can be used in mathematics education is Geogebra. Learning media as an alternative creates effective learning. The objectives of this study are: (1) to find out 80% completeness of student learning outcomes classically with KKM 75; (2) to find out the improvement of student learning outcomes; (3) to determine the timeliness in learning. This research is quasi-experimental. The study population numbered 60 people from class XI-1 and X-2, while the sample class X-1 numbered 30 people. Testing the research hypothesis using a one-party test and the cumulative frequency, paired t-test. The results showed (1) completeness of student learning outcomes in a classical manner that is 83.33%, indicating completion of completeness; (2) the value of $\text{sig} < \alpha$, then the student's posttest learning outcomes are better than the pretest; (3) appropriate use of time according to the teaching plan.

1. Introduction

At this time we are entering the 21st century which is known as the age of information society, this can be seen from the emergence of the phenomenon of digital society. This phenomenon is the impact of the industrial revolution 4.0. According to Irvan [3], the role of teachers in the 21st century is to create independent and enjoyable learning.

But in reality, it is different, based on observations obtained information that teachers do traditional learning. Learning is done by giving the material and questions on the board by the teacher, and the tasks completed by students. Transformation geometry is abstract material and has a high level of difficulty. This can be seen from the low learning outcomes achieved and not fulfilling the minimum completeness criteria (KKM).

To improve the quality of education, one alternative that must be done is to change the curriculum. Adam & Hamm [1] curriculum changes must consider the objectives, methods and character and technology of learning. Curriculum 2013 [7] the learning process is carried out with a scientific approach. A scientific approach is a scientific approach, so we need a tool or media to assist students in understanding a learning material.



Kustandi [2] media as a means of achieving learning objectives. Media involves students' activities in getting information so that learning can occur well so that the media can be used as one solution to the problems faced by the teacher. Creating technology-based learning media (ICT), all tools are connected to the internet network. The ability to learn media technology that has been connected to the internet will further increase the ease of getting information. The technological development of learning media has great potential in changing the way a person is to obtain information.

Learning media have opportunities for teachers to produce maximum work. Learning media for students are expected to be easier to absorb information quickly and efficiently. According to Akrim et al [2] applying learning media can improve students' motivation and ability to learn, because learning media provides text, images, video, audio, and animation. Using ICT media is expected to reduce student learning difficulties caused by abstract objects of study in mathematics. Kusumah [8] also suggested that computer-assisted learning innovation is good to be integrated into learning mathematical concepts, especially those concerning the transformation of geometry, calculus, statistics, and graph functions. One of the software that can be used in mathematics learning media is Geogebra.

Geogebra is a computer program for the concepts of geometry and algebra. Honhenwater & Fuchs [3] Geogebra has benefits as 1) media demonstration and visualization; 2) construction aids and 3) finding aids. This helps students learn abstract objects of geometry and algebra. So that ICT-based learning media is one alternative to creating effective learning. Japa [5] Geogebra is the right choice for a variety of mathematics because GeoGebra is a dynamic geometry software that helps create points, lines and all shapes of curves.

The problems studied are: (1) whether the Geogebra learning media has reached the mastery of learning outcomes; (2) is the Geogebra learning media effective against student learning achievement ?; (3) Is the use of time according to plan?

2. Method and Material

The research location is SMK Negeri 2 Binjai which is located at Jalan Bejomuna No.20 Binjai. The population is all students Class X, they are 60 people. The sample is X-1, they are 30 people. The research is a quasi-experimental study.

The steps in conducting data testing are as follows: (1) Descriptive Test, to see the average test and standard deviation; (2) Test prerequisites, to see the prerequisites for carrying out the test of hypotheses namely normality; (3) Hypothesis Test, to see the completeness of student learning achievement by using the cumulative frequency test, and to see the difference and effectiveness it is done by paired t-test.

3. Result and Discussion

3.1. Research Result

This research consists of two variables, namely X_1 (before) and X_2 (after) and consists of one class, namely class X-1. Descriptive test results of the data, seen in table 1.

Table 1. Descriptive Statistic

	N	Mean	Std. Deviation	Std. Error Mean
Pretest	30	76.800	3.547	.648
Posttest	30	78.400	3.349	.611

Based on the table above it can be concluded that the pre-test with a mean value of 76.8 and a standard deviation of 0.65, while post test with a mean value of 78.4 and a standard deviation of 0.61.

The prerequisite test is the normality test, seen in table 2.

Table 2. Tests of Normality

Test	Kolmogorov-Smirnov ^a		
	Statistic	df	Sig.
Pretest	.127	30	.108
Posttest	.145	30	.200

Based on the table above, it can be explained that the data has a "normal" distribution. Because the significant value in Kolmogorov-Smirnov for pre-test > from the value of the post test variable has a "normal" distribution. Because the value is significant at Kolmogorov-Smirnov for post test > of the value α (0,200* > 0,05)

To find out the completeness of learning outcomes, it is seen in table 3.

Table 3. Cumulative Frequency Pretest

	Frequency	Percent	Valid Percent
Valid	70.00	2	6.7
	73.00	2	13.3
	74.00	6	33.3
	75.00	3	43.3
	76.00	1	46.7
	77.00	2	53.3
	78.00	5	70.0
	80.00	6	90.0
	82.00	1	93.3
	83.00	1	96.7
	84.00	1	100.0
Total	30	100.0	

From the table above it can be seen that 10 people are incomplete or 30% or 70% are complete, meaning that they have not met classical completeness which is 80% with a KKM value of 75.

To find out the completeness of learning outcomes, it is seen in table 4.

Table 4. Cumulative Frequency Post test

	Frequency	Percent	Valid Percent
Valid	73.00	1	3.3
	74.00	4	16.7
	75.00	4	30.0
	77.00	1	33.3
	78.00	7	56.7
	80.00	6	76.7
	81.00	1	80.0
	82.00	3	90.0
	83.00	1	93.3
	85.00	2	100.0
Total	30	100.0	

From the table above it can be seen that there are 5 incomplete people or 16.7% or 83.3% who are complete, meaning that they have fulfilled the classical completeness of 80% with a KKM value of 75.

To find out the statistical test for correlation in Table 5.

Table 5. Paired Samples Correlation

	N	Correlation	Sig.
Pair Pretest & Posttest	30	.872	.000

Correlation: Correlation value between 2 variables: for the value of Sig. (0.00) $< \alpha$ (0.05), and the results of the correlation value of 0.872 means a strong and positive relationship.

To find out the paired t statistical test in table 6.

Table 6. Paired Samples t-test

		Paired Differences			95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
		Mean	Std. Deviasi	Std. Error Mean	Lower	Upper			
Pair	Pretest-Posttest	-1.600	1.754	.320	-2.255	-.945	-4.997	29	.000

To see the effectiveness of GeoGebra media, it can be seen in Sig. 2-tailed (0.00) $< \alpha$ (0.05). Meaning: There is a difference between before and after treatment. This means that posttest student learning outcomes are better than pretest.

3.2. Research Discussion

Moore D. Kenneth [9] the effectiveness of a measure that states how far the target (quantity, quality and time) has been achieved. Based on the results of the study showed that in quantity has effectively met the completeness of learning outcomes, with a value of 75 and the classic KKM 80% has been fulfilled that is 83.3% has been completed. There is a difference between before and after treatment. This means that posttest student learning outcomes are better than pretest. This shows that the quality has also been effective.

Nur [6] GeoGebra is a dynamic mathematical (software) that can be used as a tool in learning mathematics. This software was developed for the teaching and learning process of mathematics in schools that were observed at least three uses namely; mathematics learning media, tools to make mathematics teaching materials, solve math problems. This program can be used to improve students' understanding of the concepts they have learned and as a means to introduce or construct new concepts.

Based on this, the use of instructional media using Geogebra can improve learning outcomes both in quantity ie the number of students who reach completeness will increase, and also the quality of learning that is the ability of learning materials owned by students or the achievement of learning outcomes.

The results of achieving learning time in the experimental class by using GeoGebra media are four meetings or 8 x 45 minutes when compared to the usual learning done so far, there is no difference between the achievement of learning time in the experimental class with the achievement of normal learning time. Thus, it is known that the achievement of learning time in the experimental class using GeoGebra is the same as that of ordinary learning done with conventional methods, namely four 8 x 40 minutes meetings. This is under the criteria for learning time, namely the achievement of

minimum learning time is the same as ordinary learning, thus the achievement of learning time in the experimental class using GeoGebra media has been achieved

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