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File name:	ffendi_Dintarini_-_Analysis_of_Trigonometry_Learning_Outco...
File size:	415.97K
Page count:	14
Word count:	6,135
Character count:	31,947
Submission date:	29-Aug-2024 03:33PM (UTC+0700)
Submission ID:	2440358139

Mathematics Education Journals
Vol. 7 No. 1 February 2023

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

Analysis of Trigonometry Learning Outcomes in the Application of Geogebra-Assisted Jigsaw Methods

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Keywords:
learning outcomes;
trigonometry; jigsaw;
Geogebra

Abstract

In the material of graphs of trigonometric functions, students are expected to be able to draw graphs of their functions which later affect student learning outcomes on the material of graphs of trigonometric functions. The purpose of this study was to analyze the learning outcomes of trigonometry in the application of Geogebra-assisted jigsaw learning. The data collection technique is done by giving test questions with trigonometric function graph material. The test results are used to determine the learning outcomes of the cognitive domain. To obtain learning outcomes in the affective and psychomotor domains, it is done by filling out the observation sheet. The results of this study indicate that the learning outcomes of trigonometry in the application of Geogebra-assisted jigsaw learning at SMAN 1 Kraksaan are very good with an average score of 89.4 on the posttest. Then the affective observation sheet obtained an average of 96.6 and psychomotor 90.5 with a completeness percentage of 86.1%.

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INTRODUCTION

Education cannot be separated from human life, because it is very important in developing or educating a mindset that can be used in various fields, one of which is education (Japa, Suarjana and Widiana, 2017). One of the important abilities for students to have is problem-solving ability, because many aspects of mathematical ability involve conceptual/procedural aspects, strategy, communication, and accuracy (Nurhayati, Meirista and Suryani, 2020). Based on the results of observations and experiences of researchers as alumni of SMAN 1 Kraksaan, the learning outcomes obtained by students are still relatively low, this is because there are still many students who score below 75 or the KKM set by the school, this is because students only listen to explanations and do assignments given by the teacher. Another factor that affects low learning outcomes is that students find mathematics difficult to understand and is abstract and confusing and meaningless (Nurdin et al., 2019).

Trigonometry has an important role in several branches of science such as architecture, navigation, engineering and some branches of physics and also trigonometry is often used to calculate lengths and angles accurately (Subroto and Sholihah, 2018). Trigonometry is still difficult for students to understand because trigonometry material is abstract material (Armiati and Budi, 2021). Trigonometry

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Submission ID
trn:oid:::1:2992930635

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In the material of graphs of trigonometric functions, students are expected to be able to draw graphs of their functions which later affect student learning outcomes on the material of graphs of trigonometric functions. The purpose of this study was to analyze the learning outcomes of trigonometry in the application of Geogebra-assisted jigsaw learning. The data collection technique is done by giving test questions with trigonometric function graph material. The test results are used to determine the learning outcomes of the cognitive domain. To obtain learning outcomes in the affective and psychomotor domains, it is done by filling out the observation sheet. The results of this study indicate that the learning outcomes of trigonometry in the application of Geogebra-assisted jigsaw learning at SMAN 1 Kraksaan are very good with an average score of 89.4 on the posttest. Then the affective observation sheet obtained an average of 96.6 and psychomotor 90.5 with a completeness percentage of 86.1%.

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Trigonometry has an important role in several branches of science such as architecture, navigation, engineering and some branches of physics and also trigonometry is often used to calculate lengths and angles accurately (Subroto and Sholihah, 2018). Trigonometry is still difficult for students to understand because trigonometry material is abstract material (Armiati and Budi, 2021). Trigonometry

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
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is considered difficult by students because there are many formulas and concepts that must be memorized, so students find it difficult to analyze and describe the problems given (Nurmeidina and Djamilah, 2019).

The use of software as a learning medium is very appropriate at this time, because it is able to help educators in increasing learning success when conveying abstract and difficult mathematical material to be easier to understand because it is able to train the creativity and critical power of students (Ekawati, 2016). One of the technological and information developments in mathematics is Geogebra, the use of Geogebra when combined with a good scientific approach will produce and be able to increase students' interest and learning outcomes (Rahmawati et al., 2019). One way to increase student interest and learning outcomes is by selecting and implementing appropriate learning models (Puspitaningtyas, 2015). One learning model that is able to attract and make students active in learning activities is to use the cooperative learning model (Nurfitriyanti, 2017).

The learning model applied in this study is the Jigsaw cooperative learning model, because Jigsaw cooperative learning must involve students to actively discuss each other in groups so that their thinking skills can be trained continuously, both when expressing opinions, analyzing and defining the opinions of friend others (Astuti and Abadi, 2015). The combination of the jigsaw type cooperative learning model with the assistive media of the Geogebra software is very effective in improving learning outcomes because it can make students more active, can create conclusions which will later be supported by Geogebra software which can simulate, visualization as a tool in learning mathematics activities when understanding the concepts being studied as well as solving math problems (Handayani, 2018).

Based on the description above, the purpose of this research to analyze the trigonometry learning outcomes of students in the implementation of the Jigsaw type cooperative learning model assisted by the use of the Geogebra application.

RESEARCH METHOD

This research is a research that uses a qualitative approach, and is descriptive. The selection of types and approaches in this research is because in this study used to describe the learning outcomes of students at SMAN 1 Kraksaan. The data described is data regarding the analysis of student learning outcomes in trigonometry material on the implementation of the Jigsaw type cooperative learning model assisted by Geogebra. The subjects in this study were one class of class XI SMAN 1 Kraksaan students, totaling 36 students. The researcher chose one of the classes based on the low mathematics learning outcomes among other classes, taking into account that the students in that class had studied the material on graphs of trigonometric functions.

The test in this study was used after learning activities or after learning activities in the classroom ended. The test was made to collect data on student learning outcomes in the cognitive domain which was compiled based on one of the cognitive aspect indicators, namely C4 – analysis. There are three types of observations in this study, the first being teacher activity sheets, student activity observation sheets and student psychomotor observation sheets. Teacher activity sheets are created to find out the teacher's activities during learning which later

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
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serve as evidence that learning has been carried out in accordance with the lesson plans. Student activity sheets are created to retrieve data on student learning outcomes in the affective domain which includes all indicators of the affective domain, namely receiving, responding, appreciating, organizing and characteristics. The psychomotor observation sheet was created to collect data on learning outcomes in the psychomotor domain which includes 3 indicators, namely imitating, manipulating, and precision.

This research use write test instrument to find out the extent to which students' abilities after going through learning. The description questions used require students to answer each question in detail. The purpose of using this written test is to get data on cognitive learning outcomes. The preparation of the written test I used was adjusted based on the cognitive aspect indicators I, namely C4 – Analysis. The grid of written research instruments is as follows.

Table 1. Grid – writing test

Aspect	Question indicator	Grating
C4 – Analysis	Assessing trigonometric functions	Students can determine the maximum and minimum values, periodI and amplitude of a trigonometric function
	Apply trigonometric ratio values to the graph of trigonometric functions	Students can compare the values of trigonometric functions through the graphs of the given trigonometric functions
	Sketch a graph of a trigonometric function	Students can determine the coordinate points of a function which will be used as a graphical sketch of a trigonometric function
	Draw a graph of the trigonometric function	Students can draw graphs of trigonometric functions through the given functions

Then the observation sheet is used as a reference for observing teacher activities, attitudes and skills of students in learning using the application of the jigsaw model assisted by Geogebra Software to get good learning outcomes

Table 2. Indicators of student attitude or activeness

Activity Tipe	Indicator
Receiving	1. Students listen to the objectives read by the teacher
	2. Students answer attendance by the teacher
	3. Students pay attention when the teacher divides groups and joins their respective groups
Responding	1. Students ask questions if there are things they do not understand
Appreciate	1. Students follow the teacher's instructions to immediately discuss with their respective groups
	2. Students take individual or group tests in an orderly manner
Organizing	1. Students pay attention to the teacher when mentioning grades.
	2. Students conclude the learning material with the teacher and study the next material

Table 3. Student skill indicator

Activity Tipe	Indicator
Emulate	Students are able to imitate the example given by the teacher when using Geogebra Software
Manipulate	Students are able to use Geogebra software without seeing examples
Precision	Students are able to complete assignments using Geogebra Software correctly without seeing examples

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Furthermore, the data obtained from the results of the validity of the test questions, to find out the data, validation sheets were given to the mathematics education lecturers and teachers of SMAN 1 Kraksaan by doing a cross check using a score calculation according to the Likert Scale with the description of the assessment scale, namely "4" was very good, "3" was good, "2" fairly good value, "1" is not good value. Assessment is described according to cognitive aspects C4 – Analysis. The formula for the average percentage of the written test assessment is as follows:

$$x = \frac{Total\ score}{Total\ overall\ score} \times 100\%$$

The intervals and categories of student test results are as follows:

Tabel 5. Interval and Category of Test Results

No	Interval	Category
1	$80 < x \leq 100$	Very Good
2	$75 < x \leq 80$	Good
3	$65 < x \leq 75$	Sufficient
4	$x \leq 65$	Deficient

To analyze student activities, it can be done by collecting data obtained based on student activity observation sheets. The assessment can be seen from the score on the observation sheet that is used using the calculation of the score according to the Likert Scale with the description of the rating scale, namely "4" is very good, "3" is good, "2" is quite good, "1" is not good. The percentage of the score on the observation sheet used is qualified to determine student attitudes in the learning process. The percentage of success is obtained from the average percentage of students in each meeting.

$$P = \frac{acquired\ score}{maximum\ score} \times 100\%$$

Finding the average percentage of student attitudes or activities from all meetings can use the formula:

$$Average = \frac{total\ percentage\ per\ meeting}{number\ of\ meetings}$$

Student success in learning activities can be measured as follows:

Table 6. The success of student attitudes or activities

No	Interval Score	Category
1	$85 < x \leq 100$	Very Good
2	$70 < x \leq 85$	Good
3	$55 < x \leq 70$	Quite Good
4	$x \leq 55$	Not Good

To analyze student skills, this can be done by collecting data obtained based on student skills observation sheets. The assessment can be seen from the score on the observation sheet used using a score calculation according to the Likert Scale with a description of the rating scale, namely "4" has very good value, "3" has good

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
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value, "2" has good enough value, "1" has bad value. The percentage of scores obtained on the observation sheet I used is qualified to determine students' attitudes in the learning process. The percentage of success is obtained from the average percentage of students at each meeting.

$$P = \frac{acquired\ score}{maximum\ score} \times 100\%$$

Finding the average percentage of student attitudes or activities from all meetings can use the formula:

$$Average = \frac{total\ percentage\ per\ meeting}{number\ of\ meetings}$$

Student success in learning skills can be measured as follows:

Table 7. Student skill success

No	Interval Score	Category
1	$85 < x \leq 100$	Very Good
2	$70 < x \leq 85$	Good
3	$55 < x \leq 70$	Quite Good
4	$x \leq 55$	Not Good

RESULTS AND DISCUSSION

During the research, the researcher used a jigsaw cooperative learning model with a lesson plan that had been adapted to what was in force at SMAN 1 Kraksaan. The observation results explain the teacher's activities during the 2 meetings which represented in the following table.

Tabel 8. Teacher Activity Assessment

Aspect	Observed Things	Meeting	
		1	**2**
Early Learning	1. Opening the lesson	4	4
	2. Prepare students to take part in learning	3	4
	3. Carry out appreciation activities	3	3
	4. Provide motivation for students in learning	3	4
Core Learning Activities	1. Doing exploration activities	4	3
	2. Carry out elaboration activities	3	4
	3. Carry out activities to confirm result	4	4
Core Learning	1. Draw conclusions on teaching material	4	3
	2. Give assignments	4	4
	3. Provide material information	4	4
	4. Closing the learning process	4	3
Mastery of Teaching Materials	1. Demonstrate mastery of teaching materials	4	4
	2. Associating material with everyday life	3	3
Learning Strategy	1. Applying the Geogebra-assisted jigsaw learning model	4	4
Utilization	1. Utilizing media or learning aids	4	4
	2. Utilize learning resources (books)	3	3
Triggering learning	1. Fostering active student participation	3	4
	2. Show an open attitude towards students	3	3
	3. Cultivate student enthusiasm	4	3
	4. Grow students' self-confidence	3	4
Use of Language	1. Use spoken, written, and clear language	4	4

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	2. Deliver messages in appropriate style assessment of learning process and outcomes	4	4
Assessment of Learning Process and Outcomes	1. Monitoring learning progress during the learning process	4	4
	2. Conduct a final assessment in accordance with the learning objectives	3	4
Closing	1. Reflecting	4	3
	2. Carry out follow-up actions	4	4
Total Score		**94**	**95**
Average teacher activity score		**90,3**	**91,3**

Based on the assessment made by the subject teacher during the learning activities which were divided into the 10 aspects above, it has been shown that researchers in the application of learning have implemented lesson plans that have been adapted to the school well. This can be seen through the number of scores and averages in all meetings. From the table above, the researcher at the first meeting obtained a score of 94 out of 104, with an average score of 90.3. Then at the second meeting the researcher obtained a total score of 95 out of 104 with an average of 91.3, which is already classified as very good. This means that the researcher can carry out or carry out the learning stages in accordance with the prepared lesson plans.

a. Cognitive Realm Learning Outcomes

In collecting cognitive data students are carried out by giving pretest and posttest questions. The pretest was given at the first meeting, and the posttest was carried out at the second meeting to be able to see the learning outcomes in the cognitive domain before and after the implementation of Geogebra-assisted jigsaw learning.

1. Analysis of student tests before applying Geogebra-assisted jigsaw learning

The results of this analysis are based on the pretest scores given to students before the application of Geogebra-assisted jigsaw learning taken from 36 students.

Table 9. Results of student ability analysis based on indicators of questions at meeting 1

No	Aspect	Average	Category
1	Can determine the maximum and minimum values, period and amplitude of a trigonometric function	50	Deficient
2	Can compare trigonometric function values through the given trigonometric function graphs	19,4	Deficient
3	Can determine the coordinates of a function that will be used as a graph sketch of a trigonometric function	36,1	Deficient
4	Can draw graphs of trigonometric functions through given functions	25	Deficient
	Overall Average	**32,6**	**Deficient**

Based on the table above on the results of the pretest students get scores that are included in the (less) category. This can be proven based on the average obtained in each aspect. In the first aspect, it obtained the largest average compared to other aspects, namely 50% in the less category. The second aspect gets an

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
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average score of 19.4% in the less category. The third aspect gets an average score of 36.1% in the less category. The fourth aspect gets an average score of 25% in the less category.

Table 10. Result student answers analysis based on answer category

Question	Answer	Average
1	a. Correct answer, according to indicators, complete and logical	8,3%
	b. The answer is correct, according to indicator, but there are a few wrong answers	16,7%
	c. The answers are correct but some are not in accordiing with the indicators	11,1%
	d. The answer is yes but it doesn't match the indicator	63,9%
2	a. Correct answer, according to indicators, complete and logical	13,9%
	b. The answer is correct, according to indicator, but there are a few wrong answers	19,4%
	c. The answers are correct but some are not in accordiing with the indicators	16,7
	d. The answer is yes but it doesn't match the indicator	50%
3	a. Correct answer, according to indicators, complete and logical	2,8%
	b. The answer is correct, according to indicator, but there are a few wrong answers	5,5%
	c. The answers are correct but some are not in accordiing with the indicators	11,1%
	d. The answer is yes but it doesn't match the indicator	80,6%
4	a. Correct answer, according to indicators, complete and logical	2,8%
	b. The answer is correct, according to indicator, but there are a few wrong answers	5,5%
	c. The answers are correct but some are not in accordiing with the indicators	0%
	d. The answer is yes but it doesn't match the indicator	91,7%
5	a. Correct answer, according to indicators, complete and logical	0%
	b. The answer is correct, according to indicator, but there are a few wrong answers	2,8%
	c. The answers are correct but some are not in accordiing with the indicators	13,9%
	d. The answer is yes but it doesn't match the indicator	91,7%

Based on the table above, only a few students can answer each question correctly, according to the indicators, completely and logically. So that each student does not get a score above the KKM that has been determined by the school, namely 75. Thus the cognitive learning outcomes of students before the application of jigsaw learning are still included in the poor category.

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Table 11. Result of Analysis of Student Values in The Pretest

Total Value	Frequency	Percentage	Category
55	2	5,6%	Deficient
50	6	16,7%	Deficient
45	4	11,1%	Deficient
40	3	8,3%	Deficient
35	6	16,7%	Deficient
30	5	13,9%	Deficient
25	10	27,7%	Deficient
Amount	**36**	**100%**	

From table 11 it can be seen that 36 students got a score that was still less than the KKM that had been determined by the school, namely 75. The average obtained was 36.5. Thus the cognitive learning outcomes of students before the application of Geogebra-assisted jigsaw learning are still relatively lacking.

Table 12. Result of Student Completeness Analysis at Meeting 1

Interval	Category	Frequence	Percentage
$75 \leq x \leq 100$	Complete	0	0%
$0 \leq x < 75$	Not Complete	36	100%

Based on the data obtained and adjusted to the categorization from table 12, it can be concluded that prior to the application of Geogebra-assisted jigsaw learning, the overall cognitive learning outcomes of students were still in the incomplete category, both individually and classically. It was shown from the results of the pretest that no one had obtained the KKM score that had been determined by the school, which was 75.

2. Analysis of student tests after applying Geogebra-assisted jigsaw learning
The results of the analysis were based on the posttest scores given to students after the implementation of Geogebra-assisted Jigsaw learning taken from 36 students.

Table 13. Result of Student Ability on Question Indicators at Meeting 2

No	Aspect	Average	Category
1	Can determine the maximum and minimum values, period and amplitude of a trigonometric function	100%	Very Good
2	Can compare trigonometric function values through the given trigonometric function graphs	88,9%	Very Good
3	Can determine the coordinates of a function that will be used as a graph sketch of a trigonometric function	94,4%	Very Good
4	Can draw graphs of trigonometric functions through given functions	91,7%	Very Good
	Overall Average	**93,7%**	Very Good

Based on the data from the table above obtained from the posttest, there are very significant changes in all aspects of learning the graphs of trigonometry functions. In the first aspect, it gets an average score of 100% which in the first aspect before the application of Geogebra-assisted jigsaw learning only gets an average score of 50%. Then in the second aspect, the average score was 88.9%, while the previous average score was only 19.4%. Then in the third aspect it gets

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
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an average score of 94.4% with the previous average score of 36.1%. Finally, the fourth aspect gets an average score of 91.7% where the previous score was only 25%. The average of all aspects got a score of 93.7% with a very good category.

Table 14. Result of Analysis of Student Values at Meeting 2 by Category

Question		Answer	Average
1	a.	Correct answer, according to indicators, complete and logical	77,9%
	b.	The answer is correct, according to indicator, but there are a few wrong answers	13,8%
	c.	The answers are correct but some are not in accordiing with the indicators	2,8%
	d.	The answer is yes but it doesn't match the indicator	5,5%
2	a.	Correct answer, according to indicators, complete and logical	83,4%
	b.	The answer is correct, according to indicator, but there are a few wrong answers	11,1%
	c.	The answers are correct but some are not in accordiing with the indicators	5,5%
	d.	The answer is yes but it doesn't match the indicator	0%
3	a.	Correct answer, according to indicators, complete and logical	69,4%
	b.	The answer is correct, according to indicator, but there are a few wrong answers	16,7%
	c.	The answers are correct but some are not in accordiing with the indicators	2,8%
	d.	The answer is yes but it doesn't match the indicator	11,1%
4	a.	Correct answer, according to indicators, complete and logical	72,3%
	b.	The answer is correct, according to indicator, but there are a few wrong answers	11,1%
	c.	The answers are correct but some are not in accordiing with the indicators	8,3%
	d.	The answer is yes but it doesn't match the indicator	8,3%
5	a.	Correct answer, according to indicators, complete and logical	77,9%
	b.	The answer is correct, according to indicator, but there are a few wrong answers	8,3%
	c.	The answers are correct but some are not in accordiing with the indicators	5,5%
	d.	The answer is yes but it doesn't match the indicator	8,3%

Based on the data in the table above obtained from the posttest results, there is a very significant difference from the previous data. The percentage of students' answers to each question correctly, according to indicators, completely and logically changed significantly. Then the answers to the questions that are correct, according to the indicators but there are a few things that are wrong, there are also changes in each question. Then for correct answers but there are some that do not match the indicators and there are answers but do not match the

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
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indicators there is a decrease from the data that has been obtained from the pretest.

Table 15. Result of Analysis of Student Values in The Posttest

Total Value	Frequence	Percentage	Category
100	16	44,3%	Very Good
95	5	13,9%	Very Good
90	2	5,6%	Very Good
85	4	11,1%	Very Good
80	1	2,8%	Good
75	3	8,3%	Sufficient
70	2	5,6%	Sufficient
65	1	2,8%	Deficient
60	1	2,8%	Deficient
55	1	2,8%	Deficient
Amount	**36**	**100%**	

Based on the analysis of the data from the posttest results in the categorization there were 27 students who got the very good category, 1 student in the good category, 5 students with the sufficient category, and 3 students with the less category. Then the average score obtained was 89.4 with a very good category. From these data it can be seen changes in students' cognitive learning outcomes compared to pretest results. It can be concluded that the cognitive learning outcomes of students after the application of Geogebra-assisted jigsaw learning are classified as very good.

Table 16. Result of Student Completeness Analysis at Meeting 2

Interval	Category	Frequence	Percentage
$75 \leq x \leq 100$	Complete	31	86,1%
$0 \leq x < 75$	Not Complete	5	13,9%

Based on the data obtained and adjusted to the categorization of the table above, it can be concluded that after the application of Geogebra-assisted jigsaw learning, the overall cognitive learning outcomes of students get a percentage of completeness of 86.1% and a percentage of incompleteness of 13.9%. Individually there are still 5 students who did not complete, but completed classically. This was shown in the results of the posttest that only 5 students did not complete, but 31 other students completed.

b. Affective Domain Learning Outcomes

In taking the students' affective data, it was done by filling in the observation sheet for 36 students. Filling is done in every meeting or done 2 times. The filling and assessment of the affective observation sheet was carried out by the researcher and assisted by the subject teacher.

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
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Tabel 17. Result of Affective Observation Sheet Analysis

Aspect	Observed Things	Assessment Score			
		1	2	3	4
Receiving	1. Students listen to the objectives read by the teacher		8,3%	8,3%	83,4%
	2. Student answer the attendance read by the teacher				100%
	3. Student pay attention when the teacher distributes group and joins their respective groups			2,8%	97,2%
Responding	1. Student ask questions if there are things that have not understood		8,3%	5,5%	86,2%
Appreciate	1. Student follow the teacher's instructions to immediately discuss with their respective group			11,1%	88,9%
	2. Student take the individual or group tests in an orderly manner		2,8%	5,5%	91,7%
Organizing	1. Students pay attention to the teacher when mentioning grades		5,5%	11,1	83,4%
	2. Students summarize learning materials with the teacher and study the next material		5,5%	2,8%	91,7%

Based on the data on the analysis of students' affective learning outcomes obtained through the observation sheet at this meeting, all aspects received high scores. The scores obtained at this meeting were high with an average score of 96.6. It can be concluded that Geogebra-assisted jigsaw learning can support students' affective values in learning. This was shown through the observational data obtained at the end of the meeting which obtained a high score so that it was included in the very good category.

c. Psychomotor Domain Learning Outcomes

In collecting student psychomotor data, it was carried out by filling out observation sheets for 36 students. Filling is done in the application of Geogebra assisted jigsaw learning. The filling and assessment of the psychomotor observation sheet was carried out by the researcher and assisted by the subject teacher.

Table 18. Result of Student Psychomotor Sheet Analysis

Activity Type	Indicators	Assessment Score			
		1	2	3	4
Emulate	Students are able to imitate the example given by the teacher when using Geogebra Software			8,3%	91,7%
Manipulate	Students are able to use Geogebra software without seeing examples		2,8%	11,1%	86,1%
Precision	Students are able to complete assignments using Geogebra Software correctly without seeing examples	2,8%	5,6%	8,3%%	83,3%

Mathematics Education Journals
Vol. 7 No. 1 February 2023
ISSN : 2579-5724
ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

Based on the research above, this research was conducted at SMAN 1 Kraksaan to analyze trigonometry learning outcomes in the application of Geogebra-assisted jigsaw learning. To determine learning outcomes which consist of 3 domains, namely cognitive, affective and psychomotor, written tests and observation sheets were used. The subjects in this study were all students in class XI as many as 36 students.

Obtaining data in the cognitive domain uses written test sheets which are divided into pretest and posttest. Giving pretest questions is done at the first meeting or before the application of Geogebra-assisted jigsaw learning. From the pretest results obtained, it shows that the scores obtained by all students in completeness are still in the incomplete category with a percentage of 100%. Then for the results of the posttest which was carried out at the second meeting or after the application of Geogebra-assisted jigsaw learning obtained a completeness percentage of 86.1%. The results of research conducted by Ekawati (2016) at SMA Negeri 1 Sanggau Ledo show that jigsaw type cooperative learning can improve student learning outcomes in class X on vector material.

In the acquisition of affective domain data obtained by filling out affective observation sheets. The results of data analysis obtained from the observation sheet are included in the very good category. Then in the psychomotor domain Idata get a high percentage of 4 points. In the imitating aspect, a score of 91.7% was obtained, the manipulation aspect was scored 86.1%, and manipulation was scored 83.3%, thus it can be concluded that the students' scores in the psychomotor domain were included in the very good category. In Muhammad Syahrul Kahar's research, Zakiyah Anwar (2020) states that students taught by jigsaw learning get better learning outcomes compared to conventional learning.

During the learning that was carried out with the application of the Geogebra-assisted jigsaw, the students were still confused at first and looked awkward to be active in learning activities, especially when operating the Geogebra software, discussing and asking other students. However, after the learning took place the students seemed to quickly adapt to the learning given because the researcher directed and explained the operation of Geogebra and how to have group discussions according to jigsaw learning. Cooperation and assistance from subject teachers is one of the factors in the successful implementation of this Geogebra-assisted jigsaw learning. In addition, the involvement of students who actively participate in learning is also one of the factors supporting the implementation of good learning.

In Belladina's research, Handayanto and Shodiqin (2019) stated that cooperative learning with the help of Geogebra can improve student learning outcomes because cooperative learning with the help of Geogebra can increase student learning motivation which will later affect student learning outcomes. This is in line with the results of research conducted by Pratiwi (2016) which states that the active role of students in using Geogebra in mathematics learning will make it easier for students to understand mathematical concepts so that students get better learning outcomes.

Mathematics Education Journals
Vol. 7 No. 1 February 2023
ISSN : 2579-5724
ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

CONCLUSION

It was found in the discussion that students were very easy to adapt to the application of Geogebra-assisted jigsaw learning so as to obtain satisfactory results in all three domains. Students got very significant different scores maybe because the pretest and posttest questions were the same, even though at the end of the pretest the researcher did not provide an answer key so that before the posttest the students still did not know the real answer to the question. Giving the same questions on the pretest and posttest is also not entirely wrong because there are still some students who do not pass the posttest, this shows that students can answer the written test because of their understanding of the material being taught. For 5 students who did not complete, it is known that the score they got on the psychomotor observation sheet was low. Therefore, it can also be said that the understanding and operation of Geogebra in learning has a positive impact on students' cognitive learning outcomes. Then for the affective domain, it showed great results, it could be because the meetings in this study were only 2 times, at the first meeting the researchers had not implemented Geogebra-assisted jigsaw learning, only directly gave pretest questions and after that explained about Geogebra. At the second meeting which was conducted in 3 hours of lessons, the researchers used jigsaw learning with the help of Geogebra and the learning outcomes obtained by the students were very good. Similarly, in the psychomotor domain learning outcomes, researchers used observation sheets at the second meeting or when applying Geogebra-assisted jigsaw learning. So that the results of the observation sheet show that students get very good results. Researchers can conclude that the application of learning that is new or unfamiliar to students, especially jigsaw can improve student learning outcomes in all three domains.

REFERENCES

Armiati, A. and Budi, A.S. (2021) 'Identifikasi Efektifitas Pembelajaran Trigonometri Kelas X Masa Pandemi COVID 19 Melalui Whatsapp Group', *Jurnal Gantang*, 6(1), pp. 11–17. Available at: https://doi.org/10.31629/jg.v6i1.2539.

Belladina, N., Handayanto, A. and Shodiqin, A. (2019) 'Efektifitas Model Pembelajaran Problem Based Learning dan Quantum Berbantuan Geogebra terhadap Hasil Belajar Siswa pada Materi Trigonometri Kelas X', *Imajiner: Jurnal Matematika dan Pendidikan Matematika*, 1(6), pp. 323–331. Available at: https://doi.org/10.26877/imajiner.v1i6.4861.

Ekawati, A. (2016) 'Penggunaan Software Geogebra Dan Microsoft Mathematic Dalam Pembelaran Matematika', *Math Didactic*, 2(3), pp. 148–153. Available at: https://doi.org/10.33654/math.v2i3.43.

Japa, N., Suarjana, I.M. and Widiana, W. (2017) 'Media Geogebra Dalam Pembelajaran Matematika', *International Journal of Natural Science and Engineering*, 1(2), pp. 40–47. Available at: https://doi.org/10.23887/ijnse.v1i2.12467.

Muhammad Syahrul Kahar, Zakiyah Anwar, D.K.M. (2020) 'Pengaruh Pembelajaran Kooperatif Tipe Jigsaw Terhadap Peningkatan Hasil Belajar

Siswa', *Supermat (Jurnal Pendidikan Matematika)*, 4(1), pp. 33–39. Available at: https://doi.org/10.33627/sm.v4i1.355.

Nurdin, E. *et al.* (2019) 'Pemanfaatan video pembelajaran berbasis Geogebra untuk meningkatkan kemampuan pemahaman konsep matematis siswa SMK', *Jurnal Riset Pendidikan Matematika*, 6(1), pp. 87–98. Available at: https://doi.org/10.21831/jrpm.v6i1.18421.

Nurfitriyanti, M. (2017) 'Pengaruh Model Pembelajaran Kooperatif Tipe Jigsaw terhadap Hasil Belajar IPS Kelas VIII', *Soedirman Economics Education Journal*, 1(1), p. 18. Available at: https://doi.org/10.32424/seej.v1i1.1879.

Nurhayati;, Meirista, E. and Dessy Rizky Suryani (2020) 'Pengaruh Penggunaan Geogebra Terhadap Kemampuan Pemecahan Masalah Matematika', *Pengembangan Bahan Ajar Membaca Berbasis Pendekatan Kontekstual*, 7(2), pp. 98–114.

Nurmeidina, R. and Djamilah, S. (2019) 'Pelatihan Tips dan Trik Trigonometri Mudah untuk Siswa SMA', *JUrnal Pendidikan dan Pengabdian Masyarakat*, 2(3), pp. 362–365.

Pratiwi, D.D. (2016) 'Pembelajaran Learning Cycle 5E berbantuan Geogebra terhadap Kemampuan Pemahaman Konsep Matematis', *Al-Jabar : Jurnal Pendidikan Matematika*, 7(2), pp. 191–202. Available at: https://doi.org/10.24042/ajpm.v7i2.34.

Puspitaningtyas, N.D. (2015) *Upaya Peningkatan Hasil Belajar Dan Motivasi Belajar Mata Pelajaran Kkpi Dengan Model Pembelajaran Jigsaw Pada Kelas X Paket Keahlian Busana Butik Di Smk Negeri 6 Purworejo*.

Rahmawati, N.S. *et al.* (2019) 'Analisis Minat Belajar Siswa Ma Al-Mubarok Melalui Pendekatan Saintifik Berbantuan Aplikasi Geogebra Pada Materi Statistika Dasar', *Journal On Education*, 01(03), pp. 386–395.

Subroto, T. and Sholihah, W. (2018) 'Analisis Hambatan Belajar Pada Materi Trigonometri Dalam Kemampuan Pemahaman Matematis Siswa', *IndoMath: Indonesia Mathematics Education*, 1(2), p. 109. Available at: https://doi.org/10.30738/indomath.v1i2.2624.