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IMPROVEMENT OF STUDENT LEARNING OUTCOMES WITH GUIDED DISCOVERY METHOD USING GEOGEBRA SOFTWARE IN TOPICS OF IGNORANCE CLASS IX SMP NEGERI I SARONGGI ACADEMIC YEAR 2018/2019

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ABSTRACT

Along with the progress of science and technology the education world must be willing to hold positive innovations for the advancement of education. Educational technology can change the way of conventional learning into non-conventional. Therefore the author wants to provide an alternative method of learning that is able to make students more active, namely the application of guided discovery methods using GeoGebra software.

The purpose of this study was to determine student activities, student responses and improvement in student learning outcomes through the application of guided discovery methods using GeoGebra software in the topics of ignorance of Class IX in SMPN 1 Saronggi Sumenep academic year 2018/2019.

This research was conducted in class IX SMPN 1 Saronggi Sumenep on September 2, 2018 up to September 13, 2018 in semester I of the 2018/2019 academic year with a total of 22 students. This research is a class action research and was carried out for two cycles with each cycle through the stages of planning, implementation, observation, and reflection. Researchers used the observation method to determine student activities, questionnaires to determine student responses and and test methods to determine improvement in student learning outcomes. Data analysis uses descriptive data analysis.

From the results of data analysis, it can be concluded that student activity has increased by 0.4 in the good category, student response has increased by 7.14%. with a very good category and student learning outcomes have increased by 11.91 with good criteria. So that the application of guided discovery methods using GeoGebra software can be said to be good to apply.

Keywords: Guided discovery, GeoGebran software

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A. INTRODUCTION

To improve the quality of students, teachers must be able to carry out teaching and learning processes effectively by referring to new discoveries in the field of education, especially regarding various learning strategies that can be applied in accordance with the material to be delivered to students so that the material can be optimally absorbed.

Mathematics is one of the subjects taught at school with the highest percentage of study hours compared to other subjects. Ironically, mathematics is a subject that many students dislike. For them mathematics lessons tend to be seen as subjects that are less desirable and if can be avoided, resulting in student learning outcomes that are not optimal. Fears of students are not only caused by students themselves, but the lack of teacher's ability to create situations that can bring students interested in mathematics. Then it is necessary to learn mathematics that is interesting for students so as to be able to stimulate ideas in students' minds.

Based on the reality in SMPN 1 Saronggi shows that student learning outcomes are still far from satisfactory including class IX where the author teaches. There are several possible causes of the low learning outcomes such as student input, available infrastructure, including the methods used by teachers in learning. One of the most frequently used methods is the lecture method and the question and answer method. Lecture and question and answer methods, namely teaching is still teacher centered, which in the learning process students receive more abstract and theoretical information from the teacher alone. Theoretically teaching using methods that are so lacking make students active that it is most likely that when the teacher is explaining in front, the students actually talk to themselves behind. Therefore the author wants to provide an alternative method of learning that is able to make students more active, the guided discovery method.

Sanjaya (2007: 58) suggests many factors that influence success in the teaching and learning process, including the objectives of the subject matter, methods or learning strategies, media and evaluation. The method has a big enough share in teaching and learning activities. The ability that is expected to be owned by students, will be determined by the relevance of the use of a method in accordance with the learning objectives will be achieved by the use of appropriate methods, in accordance with the standards of success imprinted in a goal.

The guided discovery learning method is a development model of Pieget's Constructivism Theory of learning that emphasizes the importance of active student activities in constructing their own knowledge. This method allows students to be active in finding concepts of mathematical knowledge with the help of teacher guidance.

According to Asra (2007: 55) creating effective learning with student involvement so that learning optimization occurs and how to grow basic skills and complex skills in students, is not something easy. This requires another aspect that is not only verbal ability but the involvement of various learning resources (learning resources) that are used. Therefore, learning media are needed as part of learning resources. Learning media is useful to complement, maintain and even

improve the quality and the ongoing learning process, the use of media in learning will improve learning activities and outcomes.

The last few years the use of information and communication technology has been widely used in the learning process. This is an option to improve efficiency and quality in education services. According to Sadiman (2009: 14) that, "Educational media as a source of learning that can channel messages, help overcome obstacles due to differences in learning styles, interests, intelligence, limited sense power, time and so on". The use of media is recognized by many education practitioners to help the learning process activities both inside and outside the classroom, especially helping to improve student achievement.

The computer is one of the media that is still popular among students who can make learning interesting. Computers have great potential to improve the quality of learning, especially in learning mathematics. Many things that are absurdly difficult for students to think of can be presented through computer simulations. This of course will further simplify the mind of students in understanding mathematics.

One computer application that can be used in learning mathematics is GeoGebra software. GeoGebra software was chosen by researchers because it saw the characteristics of SMPN students who still liked the concept of the game. GeoGebra software functions as a dynamic image media so students will play with the sliding of dots or measuring line segments and areas. In general, GeoGebra software will provide direct experience for students in learning. As such, GeoGebra software supports guided discovery activities.

Congruence and congruence are widely applied both in real life and in mathematics. This is what makes these two concepts need to be studied. Mathematics learning in congruence material will be more effective by using GeoGebra Software. GeoGebra is a dynamic geometry system software so that it can construct points, vectors, line segments, lines, conic sections, even functions and change them dynamically. (http://opensuse.org/GeoGebra).

From the problems and alternative methods available, in this study the researcher wanted to use the guided discovery method using GeoGebra Software on congruence material which is expected to be able to improve the learning outcomes of class IX students of SMPN 1 Saronggi. It is hoped that in this study students will be actively involved in the learning process so that students can master mathematics learning. Based on the description of the problem above, the researcher is interested in conducting research on "The Implementation of Guided Discovery Using GeoGebra Software to Improve Student Learning Outcomes in the topics of ignorance of Class IX Students of SMPN 1 Saronggi Sumenep Academic Year 2018/2019."

B. RESEARCH METHOD

RESEARCH TYPE

This type of research conducted by researchers is classroom action research. According to Mulyasa (2010: 11) classroom action research is an effort that examines the learning activities of a group of students by providing an action

(treatment) that is deliberately raised. The action is carried out by the teacher, by the teacher together with the students, or by students under the guidance and direction of the teacher, with a view to improving and improving the quality of learning.

Research design

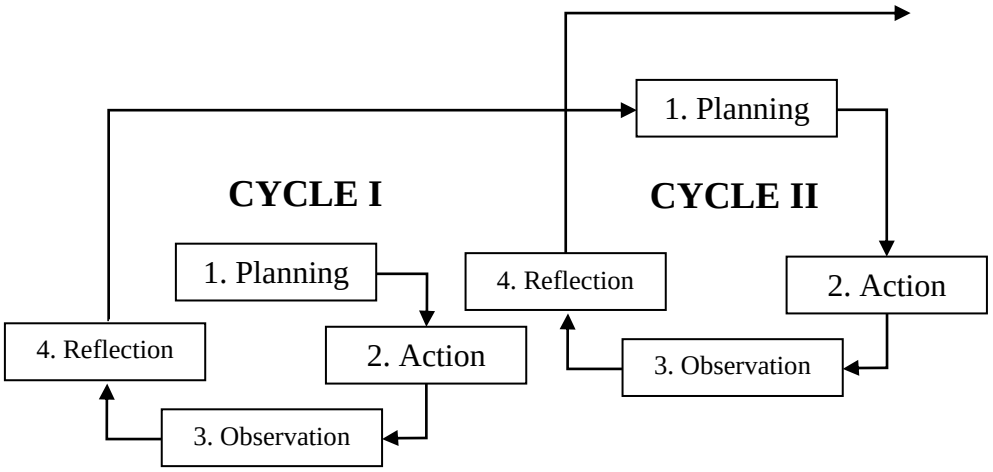
a. Research design

In this case the researcher acts as an agent of action in the classroom. Researchers are assisted by mathematics teachers who act as observers of student activities in the learning process. The action taken by the researcher aims to overcome the problems formulated in the form of planned cycles.

b. Research procedure

In general, CAR consists of 4 stages, namely planning (planning), implementation (acting), observation (observing), and reflection (reflecting).

The cycle of classroom action research according to Mulyasa (2010: 73), namely:



Then the implementation activities in this research are explained in four stages as follows:

1. Cycle I
   a. Planning
   In the planning stage include:
      1. Making RPP, LKS learning tools.
      2. Preparing computer facilities and GeoGebra files that will be used in learning.
      3. Prepare observation guidelines, questionnaires, documentation and evaluation tools in the form of learning achievement tests accompanied by answer keys and scoring guides.

   b. Action
   At this stage, the teacher carries out actions in the form of learning using guided discoveries with the help of GeoGebra software in accordance with the planned lesson plans and compiled at the planning stage, while the researcher along with other observers observe the activities and behavior of

students while learning in class. The actions taken are flexible and open to changes in accordance with what happens on the ground.

c. Observation

Observations made during the learning process takes place to obtain research data. Observation was carried out by 2 observers using observation guidelines. To obtain more objective data, observation activities also use optical or electronic devices, such as digital cameras. In this stage, observations were made of all the action processes, the results of the action, the situation where the action was and the constraints of the action.

d. Reflection

Reflection is an activity to express and review the process carried out. At this stage, researchers hold discussions with mathematics instructors about the implementation of the learning actions that have been implemented. Matters discussed include: (1) analyzing the implementation of learning actions that have been carried out, (2) explaining the design and implementation of further actions, (3) collecting data obtained. The data is in the form of observation sheet data and documentation. The results of the reflection are used to determine the next steps.

In addition, the implementation of reflection to see the success of class action, especially to see an increase in the success of cycle I. Measures to increase the success of the action seen from the results of quantitative data.

2. Cycle II

Cycle II is carried out as a continuation of cycle I, especially if there is a lack of target achievement in planning cycle I. Achievement of the target is lacking such as changing class situations, new developments, student conditions, and / or subject matter, cycle II is not carried out if the class results are in accordance with target mastery learning (65% individual and 85% classical). Conversely, if the mastery learning target has not been reached, the second cycle will be carried out. Therefore, the actions in cycle II can be given as follows:

a. Reflection Cycle I
   - Following up on the results of reflection in cycle I
   - Describe the problems that occur in cycle I.
   - Analyzing problems in cycle I
   - Determine corrective actions according to the type of problem the result of the analysis

b. Planning
   - Planning class actions in accordance with the results of reflection in cycle I
   - Arrange observation sheets in accordance with the results of reflection in the observation cycle I.
   - Compiler learning tools (RPP) in accordance with the results of reflection in the first cycle
   - Arrange the test questions sheet in accordance with the results of the test in cycle I

c. Action

The action is carried out in accordance with the stipulated lesson plans (teachers and students), observing the implementation of the KBM as it did in cycle I.

d. Observation

This observation is made after the implementation of the action, this action is carried out carefully on the activities of students in the second cycle. Observation in the second cycle is emphasized to students to understand more about the material and to know how far the implementation of the actions taken and how far the ongoing actions can produce the desired changes.

e. Reflection

The implementation of reflection is to see the success of class action, especially to see an increase in the success of cycle I. Measures to increase the success of the action seen from the results of quantitative data about the results of tests in cycle I.

Determination of Research Subjects

The population in this study were all grade IX students of SMPN 1 Saronggi Sumenep in the odd semester of the 2018/2019 school year. The population consists of two classes, which are shown in the following table:

Table 3.1
Research Population Data

Class	Total
IX A	22
IX B	12

Data source: class list

The sample is part or representative of the population studied (Arikunto, 2002: 109). In this study the sample was chosen based on information that precedes the state of the population or also called purposive sampling. In the purposive sampling technique, sampling is oriented towards sample selection where the population and the specific purpose of the study are known to the researcher from the beginning. The sample to be selected needs to be known in advance its characteristics (can be through initial studies) so that the selected sample is relevant to the objectives and research problems (Riyanto, 1996: 64).
In this case the researcher used one class, class IX A as a class to be taught a lesson using the guided discovery method using GeoGebra Software with 16 students.

COLLECTING DATA

In this study, researchers used direct observation. That is done directly when learning mathematics which is carried out using guided discoveries using GeoGebra Software at SMPN 1 Saronggi Sumenep.

Observation is used to determine student activities when learning takes place. The aspects observed were student activeness in paying attention to teacher submission, the ability to read information available in worksheets and identifying problems, the ability to collect data and information to answer problem formulations, the ability to discuss in groups, the activeness of asking unclear questions, the ability to draw conclusions , kemapuan responsible (presentation) results of the analysis.

To express students' knowledge, attitudes and opinions about the application of cooperative learning with the guided discovery method in learning mathematics, researchers used a questionnaire in the form of a checklist, a list, the respondents only need to put a check mark (√) in the appropriate column.

To determine student learning outcomes after the application of guided discoveries using GeoGebra Software, researchers provide tests to students in the form of giving questions in the form of objective essay tests. because an objective essay test allows students to apply everything they mastered to the maximum, pouring their thoughts and creativity in solving problems. Essay form test is a type of learning progress test that requires answers that are discussion or description of words (Arikunto, 2002: 162).

The test used is an objective test of 4 items. The steps to make a test are as follows:

1) Arranging the questions grid (the research instrument grid).
2) Making question items.
3) Generate an answer key.
4) Make an answer score.
5) Conducting instrument trials

Before the instrument is used as a data collection tool, the test instrument needs to be tested in advance with the aim to find out the feasibility of the test questions made, so that it can know the level of validity, reliability, level of difficulty and different power.

ANALYSIS DATA

a. Observation

This observation method is used to determine student activities during learning using the guided discovery method with geogebra software, while the assessment criteria are:

Students doing very well = 4
Students doing well = 3
Students do enough = 2
Students do less = 1

To find out the overall value of group activity the formula is used

$$NA = \frac{\sum n}{\sum a}$$ (Rofiki 2008:51)

explanation:

NA = Final score

n = The value of each aspect observed
a = aspect observed

With the final determination value category as follows:

$3{,}50 < NA \leq 4{,}00$ = excellent

$2{,}50 < NA \leq 3{,}50$ = good

$1{,}50 < NA \leq 2{,}50$ = enough

$0{,}00 \leq NA \leq 1{,}50$ = less

b. Questionnaire

In an effort to find out students' responses to the use of the guided discovery method using GeoGebra Software to improve learning outcomes using a research formula in the form of a percentage calculated using the formula:

$$R_i = \frac{S_i}{n} \times 100\%$$ (Kusaeri dalam Rofiki 2008:52)

Explanation:

R_i = Percentage of students who say "yes"
S_i = Many students say "yes"
n = Lots of students

With the category of determining the percentage of student responses that state "yes" as follows:

$75{,}00\% < R_i \leq 100{,}00\%$ = excellent

$50{,}00\% < R_i \leq 75.00\%$ = Good

$25{,}00\% < R_i \leq 50{,}00\%$ = Enough

$0{,}00\% \leq R_i \leq 25{,}00\%$ = Less

c. Test

Improved student learning outcomes can be seen from the results of tests conducted after learning activities take place. In this research the data analysis technique used is comparative descriptive, which is a statistical technique by

comparing the results of the first cycle and the second cycle by using the average value (mean) using the following formula:

$$\bar{x} = \frac{\sum x_i}{n}$$

Explanation:

$\bar{x}$ = mean

$\sum x_i$ = the number of i data

n = lots of data

(Sudjana, 2005:67)

With the following learning outcomes criteria:

Tabel

List of Qualifications for Student Learning Outcomes

Scores	Value	Qualification
86 – 100	A	Excellent
71 – 85	B	Good
56 – 70	C	Enough
41 – 55	D	Less
< 40	E	Very less

Source: KTSP Middle School Student Learning Outcomes Report

C. RESULT AND DISCUSSION

Data Analysis of Student Activity Observation Results

Observation of student activities during the implementation of the guided discovery method with geogebra software on the subject of the ninth grade of SMPN 1 Saronggi sumenep in academic year 2018/2019, can be seen in the following table:

Table 1

Observation Data of Student Activities in Teaching and Learning Process with the Guided Discovery Method with GeoGebra Cycle I Software

Group	**No Subject**	**Cycle I**			
		aspect observed			
		1	**2**	**3**	**4**
I	1	2	4	3	3
II	2	3	3	4	3
III	3	4	2	3	3
II	4	3	4	3	3
I	5	3	3	3	2

V	6	3	3	3	3
III	7	3	4	3	3
V	8	3	3	3	4
IV	9	3	4	3	3
IV	10	3	3	3	4
II	11	2	3	3	3
I	12	3	4	3	3
IV	13	4	3	3	2
IV	14	3	3	3	2
V	15	2	3	3	2
V	16	3	3	3	3
I	17	3	4	3	3
II	18	4	3	3	3
III	19	2	4	3	3
I	20	3	3	3	3
II	21	3	4	4	3
III	22	3	3	3	2
Total		65	73	68	63
Mean		2.95	3.32	3.09	2.86

Data source: Cycle I observation sheet students

From the final scores of each of the above aspects, it can be seen that the average final value of the 4 aspects observed in cycle II is

$$NA = \frac{\sum n}{\sum a} = \frac{2.95 + 3.32 + 3.09 + 2.86}{4} = \frac{12,22}{4} = 3,05$$

With reference to the category of determining the final grade presented in chapter III, the final grade obtained for the observation of student activities in this study is in the good category.

Table 2

Observation Data of Student Activities in Teaching and Learning Process with the Guided Discovery Method with GeoGebra Cycle II Software

Group	**No Subject**	**Cycle II**			
		Aspect observed			
		1	**2**	**3**	**4**
I	1	4	3	3	4
II	2	3	3	3	4
III	3	3	3	4	4
II	4	4	3	3	3
I	5	4	3	4	4
V	6	3	4	3	4
III	7	3	4	3	3
V	8	3	4	4	3
IV	9	4	3	4	3
IV	10	4	3	4	4

II	11	4	4	3	3
I	12	3	4	4	4
IV	13	3	4	3	3
IV	14	3	3	4	4
V	15	4	4	4	3
V	16	4	3	3	3
I	17	4	4	3	3
II	18	3	3	3	4
III	19	3	3	4	3
I	20	3	4	3	4
II	21	3	3	4	4
III	22	4	3	3	3
Total		76	75	76	77
Mean		3.45	3.41	3.45	3.50

Data source: Cycle II observation sheet students

From the final scores of each of the above aspects, it can be seen that the average final value of the 4 aspects observed in cycle II is

$$NA = \frac{\sum n}{\sum a} = \frac{3.45 + 3.41 + 3.45 + 3.50}{4} = \frac{13{,}81}{4} = 3{,}45$$

With reference to the category of determining the final grade presented in chapter III, the final grade obtained for the observation of student activities in this study is in the good category.

This shows that the students' mathematics learning activities in similarity using the application of the guided discovery method with geogebra software has increased from cycle I to cycle II where the value of student activity in cycle I is 3. 05 with a good category while in cycle II the value of student activity increases to 3 , 45 in either category.

Analysis of Student Response Results Data

To analyze the data of students' responses to the application of the guided discovery method with geogebra software on the subject matter of congruence, the researcher used the formula in accordance with that listed in chapter III, namely

$R_i = \frac{S_i}{n} \times 100\%$. With this formula obtained the percentage of student responses as follows:

Table 3

Questionnaire Results Data Student Responses to the Guided Discovery Method with GeoGebra Cycle I Software

No	Aspects of student response	Yes	No
1	Do you like to follow the learning strategy of the	86.36%	13.64%

	guided discovery method using GeoGebra Software?		
2	Can you study well with the use of GeoGebra Software with the guided discovery method?	77.27%	22.73%
3	Do you more easily understand the material by using GeoGebra Software with the guided discovery method?	81.82%	18.18%
4	Do you feel more valued in issuing opinions on the use of GeoGebra Software with the guided discovery method?	77.27%	22.73%
5	Did you find it easier to work on the questions after participating in learning to use GeoGebra software with the guided discovery method?	81.82%	18.18%
6	Do you have many opportunities to exchange ideas with your friends in using GeoGebra Software with guided discovery methods?	68.18%	31.82%
7	Are you interested in solving the next problems using the GeoGebra software with the guided discovery method?	81.82%	18.18%
		79.22 %	20.78 %

Data source: Cycle I observation sheet students

From table 3 we can see that the average percentage of students who said "yes" in the first cycle was 79.22% while the average percentage of students who said "no" was 20.78%. Because the average percentage of students who say yes 75%, then this shows that the students' response to the application of the guided discovery method with geogebra software in cycle I was included in the very good category.

Table 4
Questionnaire Results Data Student Responses to the Guided Discovery Method with GeoGebra Cycle II Software

No	Aspects of student response	Yes	No
1	Do you like to follow the learning strategy of the guided discovery method using GeoGebra Software?	81.82%	18.18%
2	Can you study well with the use of GeoGebra Software with the guided discovery method?	86.36%	13.64%
3	Do you more easily understand the material by using GeoGebra Software with the guided discovery method?	90.91%	9.09%
4	Do you feel more valued in issuing opinions on the use of GeoGebra Software with the guided discovery method?	77.27%	22.73%
5	Did you find it easier to work on the questions after participating in learning to use GeoGebra software with the guided discovery method?	81.82%	18.18%
6	Do you have many opportunities to exchange ideas with your friends in using GeoGebra Software with guided discovery methods?	86.36%	13.64%

7	Are you interested in solving the next problems using the GeoGebra software with the guided discovery method?	100 %	0.00%
		86.36 %	13.6 4%

Data source: Cycle II observation sheet students

From table 4 we can see that the average percentage of students who stated "yes" in cycle II was 86.36% while the average percentage of students who said "no" was 13.64%. Because the average percentage of students who say yes 75%, then this shows that students' responses to the application of the guided discovery method with geogebra software in cycle II are included in the excellent category.

From the analysis of student responses above it can be seen that there is an increase in the average percentage of students who say "yes" from cycle I and cycle II. Where in the first cycle the average percentage of student responses that stated "yes" was 79.22% with a very good category while in cycle II the average percentage of student responses that stated "yes" was 86.36% with a very good category.

Data Analysis of Test Results

To analyze student test data on the application of the guided discovery method with geogebra software on the subject matter of congruence, the researcher used the formula in accordance with that listed in chapter III, namely

$$\bar{x} = \frac{\sum x_i}{n}.$$

The results of the first cycle and second cycle can be seen in the following table:

Table 5
Student Score Results in Cycle I and Cycle II

No Subject	Cycle I Test score	Cycle II Test score
1	65	74
2	42	72
3	63	63
4	35	60
5	70	74
6	83	80
7	68	89
8	88	90
9	51	77
10	63	80
11	68	80
12	63	80
13	57	70
14	68	74

15	45	77
16	88	80
17	45	55
18	70	72
19	83	81
20	45	77
21	68	71
22	63	77
∑x	**1.391**	**1.653**

With formula $\bar{x} = \frac{\sum x_i}{n}$ the following cycle I test results will be obtained:

$$\bar{x} = \frac{\sum x_i}{n} = \frac{1.391}{22} = 63.23$$

With formula $\bar{x} = \frac{\sum x_i}{n}$ the following cycle II test results will be obtained:

$$\bar{x} = \frac{\sum x_i}{n} = \frac{1.653}{22} = 75.14$$

From the comparison of the average test scores of class IX students of SMPN 1 Saronggi in academic year 2018/2019 cycle I and cycle II, there was an increase in the average value. Where in the first cycle the average test score of students was 63.23 with sufficient learning outcomes criteria while in the second cycle the average test of students increased to 75.14 with good criteria, which means that in the second cycle the average value of student tests increased by 11.91 .

D. CLOSING

CONCLUSION

After conducting research on the implementation of the guided discovery method using GeoGebra Software in improving student achievement the Topics of ignorance of Class IX Students of SMPN 1 Saronggi Sumenep Academic Year 2018/2019." Then it can be concluded as follows:

1. Student activities in participating in learning the application of the guided discovery method using GeoGebra Software on the Topics of ignorance of class IX in SMPN 1 Saronggi Sumenep in academic year 2018/2019 increased by 0.4. Namely the value of student activities in the first cycle of 3.05 with a good category while in the second cycle the value of student activity increased to 3.45 with a good category.
2. Student responses to the learning of the application of the guided discovery method using GeoGebra Software on the Topics of ignorance of class IX in SMPN 1 Saronggi Sumenep in the academic year 2018/2019 increased by 7.14%. Namely in the first cycle the average percentage of students was

79.22% with a very good category while in the second cycle the average percentage of student responses was 86.36% with a very good category.

3. Student learning outcomes after being taught by using the guided discovery method using GeoGebra Software on the Topics of ignorance of class IX in SMPN 1 Saronggi Sumenep 2018/2019 academic year increased by 11.91. Ie in the first cycle the average value of 63.23 with sufficient learning outcomes criteria while in the second cycle the average increased to 75.14 with good criteria.

SUGGESTION

Based on the results of this study, researchers can provide the following suggestions. From the results of this study, the researchers can suggest the following:

1. The application of the guided discovery method using GeoGebra Software can also be used as an alternative learning to enable students in the teaching and learning process.
2. For fellow teachers who want to apply guided discovery learning methods using GeoGebra Software should guide students when group activities take place by going around each group in turn, especially in groups that experience difficulties.

Thus the author's suggestion in this study, hopefully the results of this study can be useful for the development of education in general.

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