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The Effectiveness of Guided Discovery Practicum Method in Global Warming Materials to Improve Students' Critical Thinking Skills

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ABSTRACT

The purpose of this research is (1) to determine the effectiveness of the guided discovery practicum method on global warming material to improve students' critical thinking, and (2) to determine the profile of students' critical thinking skills using the guided discovery practicum method on global warming material. This study is a quantitative study using a pretest-posttest control group design. The population of this study was class VII students at SMP Negeri 14 Tegal City in the 2019/2020 academic year as many as 58 students. The sampling technique used simple random sampling and obtained 24 students in class VII C as the experimental class and class VII B as many as 24 students as the control class. The results showed that: (1) the guided discovery practicum method in science learning had an effect on students' critical thinking skills, this was seen from the average value of the final ability test (posttest) in the experimental class of 77.75 and the average score in the experimental class. control of 70.00. and (2) the application of the guided discovery practicum method in the experimental class in the quite effective category in improving students' critical thinking skills. This can be seen from the average N-Gain value in the experimental class of 57.17%. Meanwhile, the control class that did not use guided discovery was less effective. This can be seen from the average value of N-Gain in the control class of 43.18%.

Keyword: Guided discovery practicum method, critical thinking skills

INTRODUCTION

The development of science and technology demands an increase in the quality of education that can be done by making improvements, changes and updating the aspects that affect the success of education, one of which is in science subjects (Ismirianti, Ratna Dewi, & Taufiq, 2016). Education according to Law no. 20 of 2003, namely conscious and planned efforts aimed at creating a learning atmosphere and learning process so that students actively develop their potential. This potential is needed for religious spiritual strength, self-control, personality, intelligence, noble character and skills needed by him, society, nation and state (Ismirianti et al., 2016) According to Atmojo (2012) learning so far has tended to only prioritize the development of intellectual aspects with teacher textbooks being the main learning resource. Students have not been able to connect understanding of subject matter at school and implement it in everyday life.

This global warming material represents a problem that we often encounter on a daily basis, which is caused by the use of technology that meets limits. This global warming occurs due to human behavior that does not care about protecting

nature, for example cutting down trees, the greenhouse effect, vehicle fumes, factory smoke, and others (Kusmianty, Widiyanto, & Kusuma, 2020). According to research (Rustia, A.L, & H.S, 2015) students think it is difficult to materialize global warming as much as 81.25% this is because students have difficulty answering the questions given by the teacher

Critical thinking skills are needed in dealing with complex problems at local, national or international levels. According to (Putra, 2015) critical thinking skills are thinking process skills that allow a person to evaluate or investigate evidence, assumptions, and logic underlying the opinions of others.

Students who have critical thinking skills will be able to overcome problems in learning so that learning achievement will also be high, while students who have low thinking skills, it is hoped that with the approaches and methods used in this study, learning achievement will increase. The low critical thinking skills of students are because students have difficulty understanding science concepts. Students only listen without being able to develop the information provided (Kusmianty *et al*., 2020). With critical thinking skills, students will find it easy to process the information they find and use it to solve problems. Activities that involve students in learning activities that require higher cognitive skills can train students to develop critical thinking skills (Kusmianty *et al*., 2020).

There are several kinds of learning methods, one of which is the guided discovery method. Junior high school students still do not have much learning experience, especially the level of critical thinking with experimental activities so that students still need guidance from the teacher, therefore the guided discovery method is one solution in increasing the level of critical thinking of students. The result was that students were active in carrying out experimental activities and the teacher was active in guiding students as facilitators (Ismirianti et al., 2016).

According to research by (Melani, 2012) states that the guided discovery method has a significant effect on cognitive learning outcomes in students. Another study, namely from (Widiadnyana, Sadia, & Suastra, 2014) states that the guided discovery method can significantly improve students' scientific attitudes. This attitude is an attitude of curiosity. Curiosity will appear in every syntax in the process of using the guided discovery method. The opinion about guided discovery is also strengthened by the research of (Sumarniti, Arcana, & Wibawa, 2014) that the guided discovery method not only affects learning activities and learning achievement, but also affects student learning outcomes. The use of the guided discovery method in the practicum process is expected to be able to train the science process skills of students. The use of the guided discovery method in the practicum process is expected to be able to train the science process skills of students.

The guided discovery method can direct students to be more active in following learning, students are no longer in a passive position or receiving teaching materials, but students play an active role in finding, looking for, managing, and concluding a problem. This method also provides a more interesting learning experience for students because they can obtain knowledge based on concepts and their relationship with knowledge obtained from the school environment (Artini, Marhaeni, & Tika, 2012). According to the opinion expressed by (Septiani, 2014) the guided discovery method is a method that can help students connect their experiences with new experiences faced so that students discover new principles.

Based on the description above, the objectives to be achieved in this study are to find out how effective the guided discovery method is and the profile of students' critical thinking skills using the guided discovery practicum method on global warming material.

RESEARCH METHOD

The approach used in this research is a quantitative approach using a quasi-experimental research type. The design used in this study was a pretest-posttest control group design.

Table 1. Design *Pretest-Posttest*

Group	Pretest	Independent Variable	Posttest
E	Yb	X1	Ya
O	Yb	X2	Ya

(Susongko, 2017 : 64)

Information:
E: Experiment Class
O: Control Class
Ya: Posttest
Yb: Pretest
X1: Guided Discovery Practicum Model
X2: Non Guided Discovery Practicum

The population in this study were students of class VII SMP Negeri 14 Tegal City from VII B and VII C. Two classes from the population were taken which had the same distribution by being tested for homogeneity first. One class will get guided discovery learning and hereinafter referred to as the experimental class. The second class as a control class without guided discovery. The sampling technique used in this study was simple random sampling technique. One class will get guided discovery practicum learning and hereinafter referred to as the experimental class. The second class as a control class used non guided discovery practicum.

The data collection methods in this study include: test and questionnaire methods. Initial data analysis includes analysis of the pretest and posttest items. The prerequisite test analysis includes: homogeneity test and normality test. The final data analysis includes: independent sample T-test, N-gain test, analysis of critical thinking skills.

RESULTS AND DISCUSSION

The skill of doing practicum of students in the control class and the experimental class before doing the research can be said to be less than optimal. Based on the results of observations that have been made in class, the method commonly used is the practicum method which is still teacher centered. The practicum method that is centered on the teacher (teacher center) is still lacking in training the skills to do practicum for students. Giving the right practicum method is expected to be able to train the skills to do practicum on students. The practicum method used in the experimental class was guided discovery practicum method, while in the control class without using the guided discovery practicum method.

The Effectiveness of Guided Discovery Practicum Methods to Improve Critical Thinking Skills

Increased critical thinking skills of students after the guided discovery practicum method was applied

The improvement of students' critical thinking skills after the guided discovery practicum method was applied is presented in image 1.

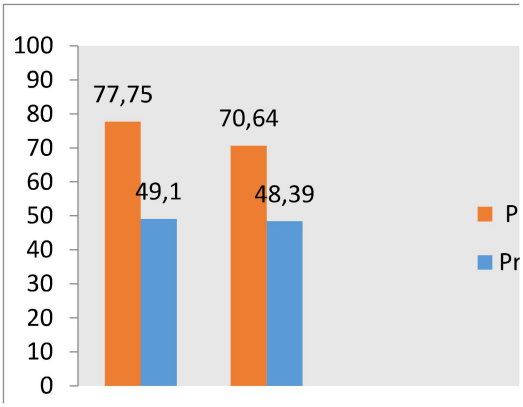

Image 1. Increasing the influence of the guided discovery practicum method on student learning outcomes

Based on the diagram image 1. the learning outcomes of students in the experimental class before being treated

obtained a mean value of 49.10 while after being treated using the guided discovery practicum method obtained a mean value of 77.75. Then the learning outcomes of students in the control class before learning obtained a mean value of 48.39 while after being given learning obtained a mean value of 70.64. So that from the diagram image above, it can be seen that there is a significant difference in learning outcomes between students in the experimental class and the control class experiencing an increase in student learning outcomes. The difference in categories in increasing learning outcomes in students is because the absorption power of each student varies depending on the speed of the students' catching power (Larasati & Hidayati, 2018). It is proven by Pascarella & Terezini (1991) statement that critical thinking involves the individual skills of students to do the following: identify a problem and assume arguments, recognize important relationships, make correct conclusions from data, draw conclusions from information or data provided, interpret whether conclusions are warranted based on the data provided, and evaluate the evidence. And it is strengthened in Dewi & Riandi (2015) research which states that with critical thinking skills, students can respond, process information and solve or solve problems.

N-Gain Test

The results of the N-Gain test can be done if the post-test result data has been tested using the independent simple t-test. Independent simple t-test was used to determine the mean difference in learning outcomes between the experimental class and the control class. Therefore, the N-Gain test can be performed. The N-Gain test is used to determine the effectiveness of an applied learning (Hake, 1999). The results of the N-Gain test in the experimental and control classes can be seen in Figure 2.

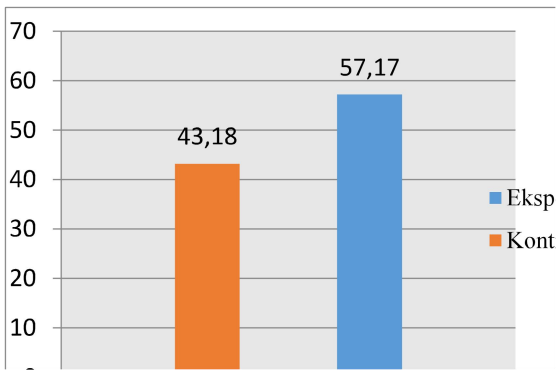

Image 2. The difference in the value of the N-Gain results

Based on the diagram image 2. the results of the N-Gain test score in the experimental class obtained a mean presentation value of 57.17%, so the use of the guided discovery practicum method in the experimental class was included in the "quite effective" category in improving critical thinking skills. Meanwhile, the control class obtained a mean percentage value of 43.18%, so the use of the non guided discovery practicum method was included in the "less effective" category. The difference in the results on the N-Gain score on improving learning outcomes in students is because the absorption power of each student is different, besides that the level of stimulus provided by the teacher to students during the learning process is not optimal, namely the learning carried out by the teacher is not fully aware of the conditions of differences in the skills of students, so that the teacher does not pay more attention to students who have poor information absorption (Larasati & Hidayati, 2018).

Profile of Students' Critical Thinking Skills

The results of the calculation of the analysis of critical thinking skills in the experimental class using the guided discovery practicum method and the non guided discovery practicum method using 5 question indicators, namely: analyzing, describing and formulating a problem, tracking cause and effect relationships, solving a problem, and evaluate and draw conclusions. The results of the calculation

of the critical thinking skills analysis consist of the control class and the experimental class, the results of the calculation are in the diagram image 3.

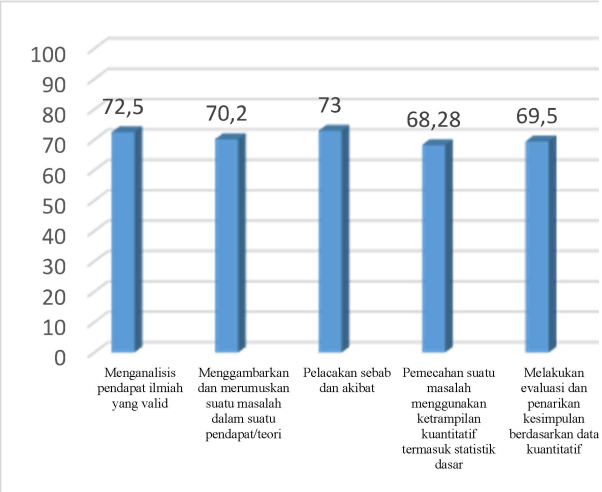

Image 3. The results of the control class critical thinking skills test

The results of the critical thinking analysis of students in image 3. Analysis of the results of students' answers from the control class postest questions given. The results of the analysis of control class students concluded that for the descriptive achievement of the highest category, namely descriptive tracking of cause and effect obtained a mean of 73.00, then the descriptive achievement of analyzing a valid scientific opinion obtained a mean of 72.50, then describing and formulating a problem in an opinion / theory obtained the mean amounting to 70.20. The low category achievement analysis includes descriptive achievement of evaluating and drawing conclusions based on quantitative data obtaining a mean of 69.50, then the lowest descriptive analysis for the control class, namely solving a problem using quantitative skills including basic statistics (for example calculating the average, probability, percentage, frequency) the mean is 68.28.

From the observation of the control class above that the lowest score on the descriptive indicator of solving a problem using quantitative skills including basic statistics (calculating the average, probability, percentage, frequency) obtained a mean of 68.28. This is because the level of understanding of the questions in the description of this indicator students still lacks control, is still confused when learning takes place and in the future it needs improvement so that the description of these indicators can be emphasized and focused so that students understand the material so that students can get improved and good results.

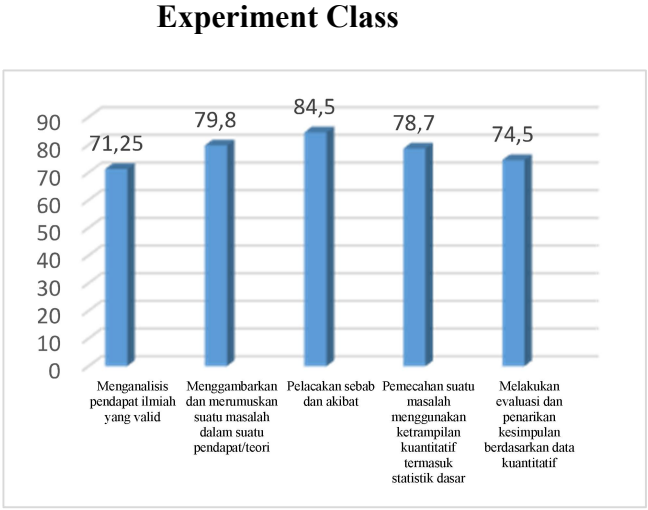

Image 4. The test results of the experimental class critical thinking skills

The results of the critical thinking analysis of students in the diagram figure 4. Analysis of the results of students' answers from the post-test questions in the experimental class given. The results of the analysis of experimental class students with the highest category descriptive achievement, namely the descriptive achievement of tracking cause and effect obtained a mean of 84.50, then the descriptive achievement of describing and formulating a problem in an opinion /theory obtained a mean of 79.80. then descriptive achievement. Solving a problem using quantitative skills including basic statistics (for example calculating the mean, probability, percentage, frequency) obtained a mean of 78.70. Low performance analysis includes descriptive achievement, evaluating and drawing conclusions based on quantitative data, obtaining a mean of 74.50. Then the lowest descriptive analysis for the experimental class is descriptive

analysis of valid scientific opinions. obtain a mean of 71.25.

From the observations of the experimental class above that the lowest value on the descriptive indicator analyzes valid scientific opinions. obtain a mean of 71.25. Due to the level of understanding of the questions in the description of this indicator, students still lack understanding when learning takes place and further improvements need to be made so that the description of these indicators can be paid more attention so that students understand the material so that students can get the best results.

Student Learning Response Questionnaire

The attitude questionnaire response analysis aims to determine the students' concern for the surrounding environment after they know some of the impacts that will occur when the surrounding environment is not maintained, in addition to assessing the cognitive domain, the affective domain also needs to be considered. The affective domain is a domain related to the values and attitudes of students using the Critical Thinking Skills indicator (Lai & Viering, 2012).

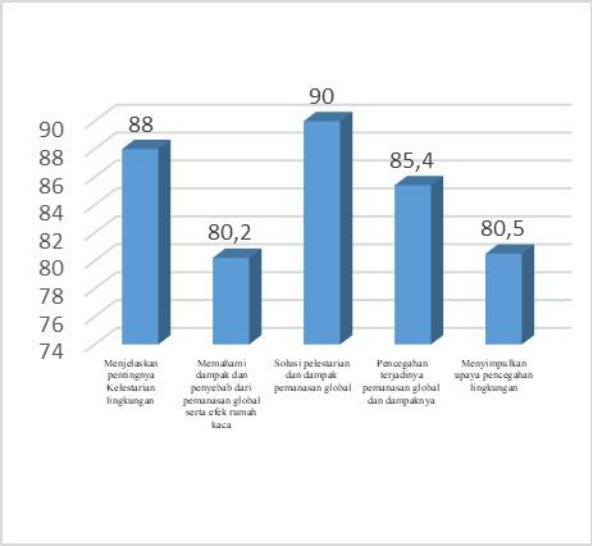

Image 5. Student questionnaire results

Analysis of the data used is based on students' answers from the questionnaire item indicators given. The results of the analysis of the questionnaire response indicators of students with the highest achievement indicators include the achievement of indicators of conservation solutions and the impact of global warming at 90, then the achievement indicators explaining the importance of environmental sustainability are 88, then the achievement indicators for preventing global warming and its impacts are 85.40. The analysis of the low achievement indicators includes concluding environmental prevention efforts of 80.50, then the analysis of the lowest achievement of understanding the impacts and causes of global warming and the greenhouse effect of 80.20.

From the above observations, the lowest score on the indicator achievement is understanding the impacts and causes of global warming and the greenhouse effect of 80.20. Due to the level of understanding in the analysis of these indicators, students still do not understand the context of the material during learning and further improvements are needed so that descriptive indicators can be paid more attention so that students understand the material so that further students can master and get good results.

Overall, based on the results of the analysis that has been done, it shows that the use of the guided discovery practicum method on global warming material is more effective in improving students' critical thinking skills. This is in accordance with the statement of Arjunan (2012), which states that learning that involves guided discovery activities can generate student interest in the lesson, improve their skills in posing problems and improve their learning ability well.

From the results of the student response questionnaire with the guided discovery method, it was concluded that the activities of students were at home during the COVID-19 pandemic. Students are very enthusiastic in the learning process at home, as evidenced by the acquisition of questionnaire response scores showing a good category, this is reinforced by research

by Gholamian (2013), which states that the guided discovery method is a tool to develop and strengthen critical thinking skills.

Guided discovery is also meaningful for teaching critical thinking skills and many students need an initial structure of steps in learning that provides rewards in order to build students' confidence and skills for critical thinking, the drawback of this questionnaire is that it does not explain students before it is applied and still constrained by the incompleteness of students when learning online. It is hoped for further research that students are given a questionnaire before carrying out the research so that the initial attitude of students can be known then parents of students are given a questionnaire to assess their children at home to monitor their children's activities when learning online

We hope that students will be more proactive and more diligent in studying from home, even though in the current pandemic situation, it will not reduce their enthusiasm to learn and achieve their dreams. Constraints in this research include, namely:

1) Students still have limited internet access when online learning takes place

2) Students still don't have their own smartphones; they still borrow them from their parents or siblings

3) Difficulties in virtual communication limitations so that teachers are still difficult to distinguish students who have mastered the material or not during the online learning process

4) The limitations of teachers in observing the activity and understanding of students in the learning process so that one of the obstacles during the assessment

CONCLUSION

Based on the results of the research and discussion of the guided discovery practicum method to improve the critical thinking skills of students at SMP Negeri 14 Tegal City, it shows that:

1. Increase the effectiveness of the guided discovery practicum method in the experimental class which is categorized as quite effective in improving students' critical thinking skills. This can be seen from the average N-Gain value in the experimental class of 57.17%. Meanwhile, the control class that used non-guided discovery was categorized as less effective. This can be seen from the N-Gain average value in the control class of 43.18%.

2. The critical thinking skills profile of students in the experimental class using the guided discovery practicum method and the control class using non-student discovery can be interpreted as an increase in improvement. This can be seen from the mean value of the final ability test (postest) in the experimental class of 77.75 and the mean value in the control class of 70.64.

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