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Influence of *Guided Discovery Learning* Models on Eighth Grade Students' Mathematical Creative Thinking Ability

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Abstract: The background of this research is the low ability to think creatively mathematically in class VIII students at MTs Ma'arif NU 04 Tamansari because the teacher's learning uses the lecture method, where students only pay attention to explanations, so students are less interested in learning and have difficulty understanding the material. Therefore, researchers use learning models that can improve students' creative thinking abilities, one of which is the Guided Discovery Learning learning Model. The Guided Discovery Learning Learning Model is a learning model that prioritizes students' activity in processing information or learning materials through guidance from the teacher and collaboration between students. The research design used in the study was the pre-test and post-test control group. In this study, the population taken as students of grade VIII MTs Ma'arif NU 04 Tamansari, namely grade VIII A, VIII B, VIII C, VIII D, and VIII E. While the sample was grade VIII B and VIII C. The sampling in this study using the technique of Convenience Sampling (Desirability Sampling). The data collection technique used in this study was in the form of essay tests in the form of pre-test and post-test. Data analysis techniques using the T-test. The results of this study show that the Guided Discovery Learning learning model was carried out very well and the Guided Discovery Learning model influences the students' ability to think creatively mathematically in grade VIII.

Keywords: creative thinking; guided discovery learning; mathematics.

A. Introduction

In the learning process, students must have the ability to solve mathematical problems. With these abilities, students will gain a deeper understanding of mathematics and the goals of education will be achieved and developed. One of the mathematical solving abilities that students must have is the ability to think creatively. Creative comes from the English word Create which means to create, creative means to have creativity, to be able to realize ideas and feelings so as to create a composition with a new atmosphere and circumstances (Marliani, 2015:17). So, it can be concluded that the ability to think creatively mathematically is an ability possessed by students to solve mathematical problems easily, simply,

The ability to think can be done well, if there is a strong reasoning power so as to produce a skill to act with the intelligence of the students themselves. Students will be able to generate unexpected ideas and get different points of view, if they have the ability to think creatively. The ability to think creatively mathematically can bring up various kinds of solutions in mathematical problems (Utami, 2020: 45). Mathematical creative thinking is an ability that includes originality, fluency, flexibility, and elaborations. Indicators of mathematical creative

thinking ability include: Fluency (fluent thinking skills), Flexibility (flexible thinking skills), Originality (original thinking skills), and Elaboration (detailing skills) (Utami, 2020: 45).

The factors that can influence students' mathematical creative thinking abilities are internal factors and external factors. Internal factors that can affect the ability to think creatively mathematically is the initial ability of the students themselves. That is, the abilities that students already have before the learning process is carried out. Students who have high thinking skills are more likely to easily receive material or understand material. While the external factors that influence students' mathematical creative thinking abilities are the learning process in the selection of learning models by the teacher. In addition to the external factors described above, there are other factors that can affect students' mathematical creative thinking abilities, namely motivation,

The ability to think creatively mathematically must be owned by students at every level, because mathematics is always there at every level of education. Mathematics is very important for everyday life, so it is necessary to have the ability to think creatively to solve math problems, but most students think that mathematics is complicated, difficult, and scary so that students are difficult to understand math material. Students' mathematical creative thinking abilities cannot develop properly if in the learning process the teacher does not involve students to be active in concept formation (Andiyana, 2018: 241).

The phenomenon of students' low creative thinking ability often occurs at all levels of education. This low ability can be demonstrated by the results of the 2015 PISA (Program for International Student Assessment) which placed Indonesia in 63rd place out of 70 countries. Likewise the results of TIMSS (The Trend International Mathematics and Science Study) in 2015, Indonesia was ranked 45th out of 50 countries (Putri, 2020:15). This phenomenon can be found in students at MTs Ma'arif NU 04 Tamansari who on average have low mathematical creative thinking abilities. During the interview conducted by the researcher with the resource person, the teacher who teach in that school, information was obtained that students' creative thinking abilities were still low because when exams or assignments were held, how to solve students still use the usual method or not varied. Student completion is not varied because when learning the teacher uses the lecture method, where students only pay attention to explanations, so students are less interested in learning and have difficulty understanding the material. The existence of these events, causing students to be more likely to be passive so that when solving math problems they experience difficulties. The learning process using the lecture method will make students not active in learning. The lack of varied learning methods can affect students' learning interest and will affect students' mathematical creative thinking abilities which become low. Student completion is not varied because when learning the teacher uses the lecture method, where students only pay attention to explanations, so students are less interested in learning and have difficulty understanding the material. The existence of these events, causing students to be more likely to be passive so that when solving math problems they experience difficulties. The learning process using the lecture method will make students not active in learning. The lack of varied learning methods can affect students' learning interest and will affect students' mathematical creative thinking abilities which become low. Student completion is not varied because when learning the teacher uses the lecture method, where students only pay attention to explanations, so students are less interested in learning and have difficulty understanding the material. The existence of these events, causing students to be

more likely to be passive so that when solving math problems they experience difficulties. The learning process using the lecture method will make students not active in learning. The lack of varied learning methods can affect students' learning interest and will affect students' mathematical creative thinking abilities which become low. causing students to be more passive so that when solving math problems they experience difficulties. The learning process using the lecture method will make students not active in learning. The lack of varied learning methods can affect students' learning interest and will affect students' mathematical creative thinking abilities which become low. causing students to be more passive so that when solving math problems they experience difficulties. The learning process using the lecture method will make students not active in learning. The lack of varied learning methods can affect students' learning interest and will affect students' mathematical creative thinking abilities which become low.

With the phenomenon of low students' mathematical creative thinking abilities, an innovative learning model is needed to develop students' mathematical creative thinking abilities. Choosing the right learning model for students will make learning less boring and more conducive, besides that it can affect students' achievement in learning mathematics. The learning process in class can be said to be good if it uses a learning model that involves active students and can participate in the learning process (Yusniawati, 2015: 88). One of the objectives of the existence of a learning model is to manage learning in class so that it is more effective and directed so as to be able to improve students' abilities to support successful learning, namely in the ability to think creatively mathematically.

One learning model that can increase student activity so that students' creative thinking skills will increase, namely the Guided Discovery Learning learning model. Guided Discovery is a form of discovery learning method which is one of the most influential cognitive instructional models from Jerome Brunner. According to Bruner, discovery learning is in accordance with the active discovery of knowledge by humans and by themselves being able to produce something good. Whereas Guided Discovery according to Brunner is that students are given a problem to find a solution to and the teacher only shows, directs, provides feedback and provides examples to guide students to easily solve a problem (Sapitro, 2012: 5).

From the above understanding, it can be concluded that the notion of the Guided Discovery Learning Learning Model is a learning model capable of creating learning situations that involve students being able to learn actively and independently in solving a problem and discovering a concept and theory, while the teacher is a facilitator and guide for the course of the learning process (Riyanti , 2018: 3). The application of the GDL learning model can provide a conducive and pleasant classroom atmosphere so that students can learn actively and are able to find formulas for solving mathematical problems creatively and innovatively. With this model, students will easily understand the material optimally and create a class atmosphere that is not boring. Therefore, the existence of a learning model is needed to improve the ability to think creatively. This model will provide broad opportunities for students to process and play an active role in learning. The stages in the guided discovery learning learning model include: Orientation, Hypothesis Generation, Conclution phase, and Regulation phase (Rini, 2021:25).

The advantages and disadvantages of the Guided Discovery Learning learning model. The advantages of this learning model are that it can help students to develop their own abilities and readiness to learn as well as mastery of skills in their cognitive processes, students gain

knowledge independently so that this knowledge will be more meaningful and can give students confidence in solving problems because this learning model focuses on independence student. While the drawbacks are that students must have readiness and mental maturity, it is not effective if it is applied in a fat class, and if the class is already accustomed to the old style learning model or conventional model then it will not be interested in the guided discovery learning model.

Based on this explanation, the author wants to conduct research that aims to describe the quality of the application of the Guided Discovery Learning model and to find out whether there is an effect of the Guided Discovery Learning model on the ability to think creatively mathematically in class VIII students.

B. Method

The approach applied is a quantitative approach. Using test instrument which done by students both before and after the study to get the data. Beside that, observation sheet is also use to observe the student's activity. The research design used in the study was the Pretest and Posttest Control Group. The research was started by giving a pretest to the experimental class and control class, then giving mathematics learning to the experimental class using the guided discovery learning model and the control class using the lecture method. After carrying out the entire learning series, the two classes were given a posttest with the aim of knowing the increase in students' mathematical creative thinking abilities.

In this study, the population taken was class VIII students at MTs Ma'arif NU 04 Tamansari in the academic year 2022/2023, which consisted of 5 classes, namely classes VIII A, VIII B, VIII C, VIII D, and VIII E. In this study, the sample taken are 2 classes (experimental class and control class). The researcher made class VIII B as the control class and class VIII C as the experimental class. Sampling in this study used the Convenience Sampling technique (Desire Sampling). The method of data analysis is by implementing analysis and analyzing the influence of the learning model by using the normality test, homogeneity test, and T test (hypothesis) with the help of *software SPSS Version 25.*

C. Results and Discussion

1. Research Result

This research begins by testing the instrument with content validation and item validation. This content validation was carried out by expert opinion by looking at the feasibility of the research instrument which includes the suitability of the material, appropriate language, and construction. The results of the analysis from the validator, namely 3.35, are included in the interval$3{,}25 \leq x \leq 4{,}00$. So from the validator it can be concluded that mathematical creative thinking questions are appropriate for use in research with the criteria of "Very Valid". As for the validation of the item items, this is done by instrument testing with assistance *software SPSS Version 25.*By using the assisted product moment correlation formula *software SPSS Version 25* generated as Table 1.

Table 1. Test Results for the Validity of Pre-Test Items

No. Items	rcount	Rtable	Information

1	0.430	0.3739	Valid
2	0.466	0.3739	Valid
3	0.415	0.3739	Valid
4	0.497	0.3739	Valid
5	0.291	0.3739	Invalid
6	0.495	0.3739	Valid
7	0.648	0.3739	Valid
8	0.423	0.3739	Valid

From the table above it can be seen that of the 8 questions, one of them is invalid, namely at number 5. Invalid item numbers cannot be used for research so they must be removed. Meanwhile, item numbers that are declared valid are still used to obtain data needed for research. So, the number of valid questions in this study totaled 7 questions, each item representing one indicator, namely questions number 1, 3, 6, and 8.

Table 2. Results of the validity test of the post-test items

No. Items	rcount	rtable	Information
1	0.554	0.3739	Valid
2	0.600	0.3739	Valid
3	0.651	0.3739	Valid
4	0.633	0.3739	Valid
5	0.620	0.3739	Valid
6	0.653	0.3739	Valid
7	0.702	0.3739	Valid
8	0.696	0.3739	Valid

From the Table 2 can be seen that all items are declared valid. So, in this study using all item questions by selecting numbers 1, 3, 5, 7 which represent one indicator.

Then donereliability testing, can use Cronbach's Alpha formula. The reliability test calculation was carried out with the help of the SPSS Version 25 application. The results of the Cronbach's Alpha reliability test on the pre-test questions can be seen in Table 3.

Table 3. Reliability Test Results Creative Thinking Ability Pretest Questions

Reliability Statistics	
Cronbach's Alpha	N of Items
,835	8

The table above shows that the Cronbach's Alpha value of the instrument for the ability to think creatively in the pre-test questions is 0.835, which means the reliability coefficient is $>$ 0.60 so it can be concluded that the instrument for the variable ability to think creatively in the pre-test questions is reliable.

Table 4. Reliability Test Results Creative Thinking Ability Posttest Questions

Reliability Statistics	
Cronbach's Alpha	N of Items
,857	8

The table above shows that the Cronbach's Alpha value of the instrument for the ability

to think creatively in the post-test questions is 0.857, which means the reliability coefficient is $>$ 0.60 so it can be concluded that the instrument for the variable ability to think creatively in the post-test questions is reliable. After testing the validity and reliability tests, data analysis is carried out, which is an activity after data from all respondents or other data sources have been collected. The activity in question is to carry out calculations to answer the problem formulation and perform calculations to test the hypotheses that have been proposed (Sugiyono, 2019: 206).

a. Implementation of The Guided Discovery Learning Model

The assessment was given to determine the ability of researchers to manage mathematics learning in the experimental class based on observations from observers 1 and 2. The level of research ability in teaching was calculated by adding up the total score and then dividing the number of aspects in the observation/observation sheet. For categorizing the ability of researchers, the following criteria are used:

Table 5. Criteria for the ability of researchers in learning with the guided discovery learning model

Ability Level	Criteria
$3{,}25 \leq x \leq 4{,}00$	Very good
$2.50 \leq x < 3{,}25$	Good
$1.75 \leq x < 2{,}50$	Pretty good
$1.00 \leq x < 1{,}75$	Not good

The results of observing learning with the Guided Discovery Learning learning model carried out by observer 1 and observer 2 namely

Table 6. Learning Observation Results Model Guided Discovery Learning

No	The Observed	Observers 1	Observers 2	Average
1	Greetings and start learning by praying	4	4	4
2	Presence of student attendance and Convey the intent and purpose of learning	4	4	4
3	Provide a stimulus so that students are active in each lesson	3	3	3
4	Provide opportunities for students to ask questions or give opinions	3	4	3,5
5	Provide opportunities for students to conclude or suspect related problems given by the teacher	4	3	3,5
6	Discuss students' conjectures or conclusions together	4	4	4
7	Guiding students in concluding the material that has been studied	4	4	4
8	Provide reflection to students	4	3	3,5
9	Closing the lesson by praying together and greeting	4	4	4
	Total	34	33	33.5
	Average	3.77	3.66	3.72

Based on the table above, the results of observations made by observer 1 obtained a score of 3.77 while for observer 2 a score of 3.66 was obtained. According to table 5 the criteria for

the ability of researchers in learning, the average value is obtained which is at an interval of $3.25 \leq x \leq 4{,}00$, which means that it is in the criteria of very well implemented.

b. Data Analysis The Effect of The Guided Discovery Learning Model on Students' Mathematical Creative Thinking Abilities

The pre-test data obtained during the study were from two classes which were research objects, namely VIII C as the experimental class and VIII B as the control class. Information was obtained that the highest score was obtained in the experimental class, namely 62.5 and the lowest value, namely 31.25 with an average -the average is 43.75, while the highest score in the control class is 62.5 and the lowest is 31.25 with an average of 45.5. After obtaining pre-test data information, the normality test, homogeneity test, and t test were carried out.

The normality test is a procedure used to determine whether the data is normally distributed or not. The normality test uses the Kolmogorov Smirnov formula. Results of data analysis using software *SPSS Version 25.*With the criteria if it is significant (p-value) $< \alpha = 0.05$, it means that the data is not normally distributed and vice versa if (p-value) is $\geq \alpha = 0.05$, it means that the data is normally distributed (Ramadhani, 2021: 197).

Based on the results of the normality test with Kolmogorov Smirnov using software *SPSS Version 25* shows that the samples used from both the experimental class and the control class are normally distributed data with a probability (Sig) greater than the alpha value. With the experimental class sig pretest value of $0.054 > 0.050$ while the control class sig pretest value is $0.088 > 0.050$.

After the samples used in the study from both the experimental class and the control class were normally distributed data with a probability (Sig) greater than the alpha value, then the homogeneity value was sought. The homogeneity test aims to determine the variance (diversity) of data from two or more groups that are homogeneous (same) or heterogeneous (not the same). Results of data analysis using software*SPSS Version 25.* With a significant criterion (p-value) of $< \alpha = 0.05$, it means that the data is not homogeneous or heterogeneous and vice versa if (p-value) is $\geq \alpha = 0.05$, it means that the data is homogeneous (Ramadhani, 2021: 214).

Based on the results of the homogeneity test using the software *SPSS Version 25* shows that the significance value (Sig) Based on Mean is $0.548 > 0.050$, so it can be concluded that the pretest data variance of the experimental class and control class is homogeneous (same).

The T test was carried out after it was known that the data taken was normally distributed. Then, to test the hypothesis in this study using the independent sample t test using software *SPSS Version 25.* This hypothesis test was carried outto find out whether there is an influence from the Guided Discovery Learning learning model on students' mathematical creative thinking abilities.

Based on the results of the independent sample t test using the software *SPSS Version 25* above it can be seen that the value of sig. (2-tailed) $0.555 > 0.05$, then H_0 accepted and H_1 rejected. This shows that the scores of the experimental class and the control class are not significantly different. can mean that $H_1 : \mu_1 = \mu_2$ conventional learning models (lectures) have no effect on the ability to think creatively mathematically in class VIII students.

The post-test data obtained during the study were from two classes which were the object of research, namely VIII C as the experimental class and VIII B as the control class.

Information was obtained that the highest score in the experimental class was 93.75 and the lowest score was 68.75 with an average of 81.25, while the highest score in the control class was 81.25 and the lowest was 37.5 with an average of 62.5.

The normality test is a procedure used to determine whether the data is normally distributed or not. The normality test uses the Kolmogorov Smirnov formula. Results of data analysis using software *SPSS Version 25.* With the criteria if it is significant (p-value) $< \alpha = 0.05$, it means that the data is not normally distributed and vice versa if (p-value) is $\geq \alpha = 0.05$, it means that the data is normally distributed (Ramadhani, 2021: 197).

Based on the results of the normality test with Kolmogorov Smirnov using software *SPSS Version 25* shows that the samples used from both the experimental class and the control class are normally distributed data with a probability (Sig) greater than the alpha value. With the experimental class sig pretest value of $0.083 > 0.050$ while the control class sig pretest value is $0.064 > 0.050$.

After the samples used in the study from both the experimental class and the control class were normally distributed data with a probability (Sig) greater than the alpha value, then the homogeneity value was sought. The homogeneity test aims to determine the variance (diversity) of data from two or more groups that are homogeneous (same) or heterogeneous (not the same). Results of data analysis using software *SPSS Version 25.* With a significant criterion (p-value) of $< \alpha = 0.05$, it means that the data is not homogeneous or heterogeneous and vice versa if (p-value) is $\geq \alpha = 0.05$, it means that the data is homogeneous (Ramadhani, 2021: 214).

Based on the results of the homogeneity test using the software *SPSS Version 25* shows that the significance value (Sig) Based on Mean is $0.001 < 0.050$, so it can be concluded that the variance of the post-test data for the experimental class and the control class is not homogeneous (not the same).

The T test was carried out after it was known that the data taken was normally distributed. Then, to test the hypothesis in this study using the independent sample t test using software *SPSS Version 25.* This hypothesis test was carried outto find out whether there is an influence from the Guided Discovery Learning learning model on students' mathematical creative thinking abilities.

Based on the results of the independent sample t test using the software *SPSS Version 25*above it can be seen that the value of sig. (2-tailed) $0.000 < 0.05$, then H_0 rejected and H_1 accepted. This shows that the scores of the experimental class and the control class are significantly different. can mean that $H_1 : \mu_1 \neq \mu_2$ the Guided Discovery Learning learning model influences the ability to think creatively mathematically in class VIII students.

2. Discussion of Research Results

This research was conducted to find out whether or not there was an influence or not from the application of the guided discovery learning model to the mathematical creative thinking abilities of class VIII students at MTs Ma'arif NU 04 Tamansari. In conducting research using two classes as research samples. Then the classes were taken according to the sampling technique, namely the Convenience Sampling technique, and the results obtained were VIII C class as the experimental class and VIII B class as the control class.

In this case, different treatment will be given between the experimental class and the

control class. The experimental class will be given treatment using the guided discovery learning model and the control class will use the lecture method. The material taught at MTs Ma'arif NU 04 Tamansari is material in the even semester, namely statistics. The thing that was examined in this study was the ability to think creatively in mathematics.

Based on the results of the research that has been done, it is known that the experimental class consisted of 24 students with the highest pretest score of 62.5 and the lowest 31.25 with an average of 43.75. Meanwhile, the control class consisted of 22 students with the highest pretest score of 62.5 and the lowest 31.25 with an average of 45.5. From the results of the pretest of the two classes, we can see that the difference in the average scores of the experimental class and the control class is not very significant. So that the students' mathematical creative thinking abilities of the two classes were not too different before being given treatment.

After being given the treatment, a posttest is then given to find out the results of the treatment that has been given. From the results of the posttest, it was found that class VIII C as the experimental class got the highest score of 93.75 and the lowest score of 68.75 with an average of 81.25. Whereas in class VIII B which is the control class, the highest score is 81.25 and the lowest score is 37.5 with an average of 62.5. From these results it is known that there is a significant difference from the results of the posttest.

After the research has been carried out and the results have been obtained, a hypothesis test will be carried out. In this case, the hypothesis test was carried out using an independent sample t test. Prior to that, normality and homogeneity tests were carried out on the pretest and posttest data from the experimental class and the control class. From the results of data analysis normally distributed with (p-value) $\geq \alpha$ = 0.05, namely the sig pretest value of the experimental class was $0.054 > 0.050$, the sig posttest value of the experimental class was $0.083 > 0.050$, the sig pretest value of the control class was $0.088 > 0.050$, and the sig posttest value of the control class was $0.064 > 0.050$. And the pretest data is homogeneous with a significance value (Sig) Based on Mean is $0.548 > 0.050$ while the posttest data is not homogeneous with a significance value (Sig) Based on Mean is $0.001 < 0.050$.

Furthermore, the t independent sample test was carried out to test the hypothesis by comparing the average values of the experimental class and the normally distributed control class. From the results of the t independent sample test using the software*SPSS Version 25*on the pretest it was found that the sig.(2-tailed) value was 0.555 which means it was greater than 0.05 so it was H_0 accepted and H_1 rejected. So it can be concluded that the scores of the experimental class and the control class did not differ significantly, it can be interpreted that the conventional learning model (lecture) has no effect on the ability to think creatively mathematically in class VIII students while the results of the t independent sample test use software *SPSS Version 25*on the posttest it was found that the sig.(2-tailed) value was 0.000, which means it was smaller than 0.05 so it was H_0 rejected and H_1 accepted. So it can be concluded that there is a significant difference in the scores of the experimental class and the control class, it can be interpreted that the Guided Discovery Learning learning model influences the ability to think creatively mathematically in class VIII students.

In this research learning model *Guided Discovery Learning* influence on students' mathematical creative thinking abilities, this is supported by research conducted by research

conducted by Ekawati in 2020 Faculty of Teacher Training and Education, University of Muhammadiyah Makassar entitled "Application of the Guided Discovery Learning Model on Physics Learning Outcomes of Class X MIPA Students of SMA Negeri 9 Enkarang". The results of this study are that there is an increase in students' physics learning outcomes after being taught by applying the guided discovery learning model with an N-Gain of 0.55 (moderate criterion). In another study conducted by Amanda Pasca Rini, et al in 2021 entitled "The Guided Discovery Learning Model, Is it Effective in Improving Students' Critical Thinking Ability?". The results of this study are that the guided discovery learning model is effectively applied to students because it can improve students' critical thinking skills. Besides that, thesis by Qorri'ah in 2011 Faculty of Tarbiyah and Teacher Training Sciences UIN Syarif Hidayatullah Jakarta entitled "Use of the Guided Discovery Learning Method to Improve Students' Conceptual Understanding of the Subject of Constructing Curved Sided Spaces". The result of this study is that increasing students' understanding of mathematical concepts using the guided discovery learning method is better than increasing students' understanding of mathematics using conventional methods (lecturing method) on the subject of curved side shapes.

D. Conclusion

Based on the research that has been done, it can be concluded that the influence of apllying Guided Discovery Learning model is carried out very well in the experimental class on statistics material and the Guided Discovery Learning model influences the ability to think creatively mathematically in class VIII students by interpreting the pretest and postest's scores analyzed.

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