IMPLEMENTATION GUIDED DISCOVERY METHOD TO THE MATHEMATICAL REPRESENTATION ABILITY BASED ON STUDENT'S LEARNING ACTIVENESS

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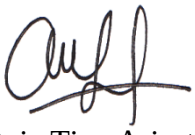

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ABSTRACT

The purpose of this study was to determine: (1) the effect of guided discovery method to the mathematical representation ability (2) the effect of student's learning activeness to the mathematical representation ability (3) The interaction between guided discovery method based on student's learning activeness to the mathematical representation ability. This research is a quasi experimental research posttest-only control group with the population all of the 9th grade student of 3rd Colomadu Junior High School academic year 2014/2015. The sample's research are 9th A and 9th D grade that consists of 31 and 30 students. The sampling technique used cluster sampling. Data collection techniques through tests, questionnaires, and documentation. Data were analyzed using two-way analysis of variance with different cells. The results obtained from the data analyzed with a significance level $\alpha = 5\%$, are: (1) There is no effect the implementation of guided discovery method to the mathematical representations ability with $F_A = 1{,}329$ (2) There is an effect among student's learning activeness to the mathematical representations ability with $F_B = 8{,}665$ (3) There is no interaction between the method of guided discovery based on student's learning activeness to the mathematical representation ability with $F_{AB} = 0{,}883$.

Keywords: guided discovery, mathematical representation ability, student's learning activeness

INTRODUCTION

Education is one of ways to develop the potential of learners, which through this educational the improvement of resources learners's quality can be implemented. In the implementation of formal education mathematics courses is a subject that must be learned in school, whether Primary School, Junior High School, and also at Senior High School the mathematics is taught to student in all majors. As for the purpose of school mathematics learning based on Decree No. 22 of 2006 are: (1) Understanding the concepts of the mathematics, describes the relationship between concepts and

apply concepts or algorithms, are flexible, accurate, efficient, and precise, in problem-solving (2) Using the pattern and properties reasoning, do the mathematics manipulation in making generalizations, draw up the proof, or explain the mathematics ideas and statements (3) Solve problems that include the ability to understand a problem, design a mathematical model, solve the model and interpret the obtained solution (4) Communicate ideas with symbols, tables, diagrams, or other media to clarify the situation or problem (5) Have attitude appreciate the usefulness of the mathematics in life, which is has a curiosity, attention, and interest in the learning mathematics, as well as a tenacious attitude and confidence in problem solving. Correspondingly with that purpose of the school mathematics learning, the national council of teacher of mathematics (NCTM) also set the standard of school mathematics learning process, which is: problem solving, reasoning, communication, connections and representation.

Based on these descriptions, the ability representations contained in the standard process that established by the Education Ministry and the NCTM. It's indicates that the ability of representation is an important ability to be developed and should be owned by the student. The representation standards established by NCTM (2000) for learning programs from pre-kindergarten through 12^{th} grade is need to allow the student for: (1) Create and use representations to organize, record, and communicate mathematical ideas (2) Select, apply, and translate among mathematical representations to solve problems (3) Use representations to model and interpret physical, social, and mathematical phenomena. Thus, the ability of mathematical representations necessary to deepen student's understanding of mathematical concepts and the relationship between concepts that they have through creating, comparing and using the representation.

Besides the ability of mathematical representations, student's learning activeness is also an important thing to be developed. In the world of education should be student-centered learning rather than on teachers, including in study of mathematics. In mathematics teaching and learning process should be interconnected or reciprocity between teachers and student so that the student were also able to actively participate in the learning process. Teaching and learning activities in the classroom is not just a

delivering teacher’s knowledge that they had to the student but also student get knowledge with their active involvement when learning activities ongoing.

Implementation of learning in the classroom is one of the main tasks of teachers. In the conventional teaching patterns participate more dominant teachers, so student likely to be passive. Conventional teaching pattern has been set student for pay attention to the teacher in the classroom teaching. Then the student is given a few examples of questions and given an assessment in the form of or homework exercises for show the mastery of the topic. It’s indicates that student are not participate actively in teaching and learning activities. Through the learning process like this, the less likely mathematical representation ability and learning activeness of student can developing.

Based on the explanation of the facts above, we need a method of learning that prioritizes activeness on student so that it can raise confidence and awareness of student to issue the mathematical ideas they had. It is as presented by Henningsen and Stein (Effendi, 2012: 3) that for develop student' mathematical abilities, then the learning should be able to make student actively involved in learning, not just copy or follow the example without knowing its meaning. The learning method with such characteristics one of them is guided discovery learning method. According Markaban (2008: 17) through guided discovery methods student are exposed to a situation where student are free to investigate and draw conclusions, student can also do conjecture, intuition and experimenting (trial and error). he teacher as a guide in helping student to use the idea or ideas, concepts and skills they have learned to find the new knowledge. Moreover in the method of learning by guided discovery, the role of student is big enough because the learning is no longer centered on oon the teachers but on the student.

Based on this background the researchers will do research under the title “Implementation Guided Discovery Method to the Mathematical Representation Ability Based on Student’s Learning Activeness”. The researcher expect guided discovery method can be one of the alternative methods that can be used by teachers to make the student active in class, so that the mathematical representation ability be optimal. The hypothesis of this research are (1) There is an effect the implementation of guided discovery method to the mathematical representations ability (2) There is

an effect student's learning activeness to the mathematical representations ability (3) There is an interaction between the method of guided discovery based on student's learning activeness to the mathematical representation ability. The purpose of this research to determine: (1) the effect of guided discovery method to the mathematical representation ability (2) the effect of student's learning activeness to the mathematical representation ability (3) The interaction between guided discovery method based on student's learning activeness to the mathematical representation ability.

RESEARCH METHOD

Type of this research is quasi-experimental research, the research absolutely to see the causal connection and in the quasi-experimental research the treatment has occurred and oversight (control) can't be done. The research design is posttest-only control group, which researchers will compare the result of two certain types of treatment, namely the experimental class and control class. The independent variable in this study is the learning method and learning activeness and the dependent variable is the mathematical representation ability.

This research were in 3rd Colomadu Junior High School, the population is student of 9th grade 3rd Colomadu Junior High School. Samples were drawn based on probability sampling techniques (cluster random sampling), where the population is divided into several groups based on certain areas or groups (clusters) and finally drawn whole randomly as samples (Sugiyono, 2009: 81). Thus, each subject got the same opportunity to be sampled. Samples from this study were student of 9th C grade as an experimental class is subjected implementation guided discovery learning methods and the student of 9th A grade as a control class is subjected implementation conventional teaching methods

Collecting data using test methods to collect data the mathematical representations ability, questionnaire to obtain data on student's learning activeness and documentation methods to collect data last test scores of 9th class student 3rd Colomadu Junior High School academic year 2014/2015. The post test and questionnaire should be tested whether it is appropriate to use in research. The test used is validity and reliability of questions and item questionnaire. To determine the

validity of each item instrument used Product Moment Correlation formula while to find the questions reliability used Alpha Cronbach formula.

Before being given treatments, tested the balance between experimental class and control class. This test conducted to determine whether the two classes which the experimental class and control class has a state balanced or not, in other words, to determine whether there were significant differences in mean both research samples the same or not. After the data obtained data analysis to test the hypothesis using two-way analysis of variance with different cells. Before the analysis of variance should be tested prerequisite that is the normality test uses Liliefors method and homogeneity test using Bartlett test with significance level of 5%. Then, if the analysis results of variance show that H_0 is rejected there should be multiple comparison test using Scheffe method.

RESULTS AND DISCUSSION

Based on the results of balance test known that the experimental class and control class have the same ability. After both class gained 3 treatments, given the mathematics representation ability post-test and asked to complete a questionnaire learning activeness. Then the data obtained were tested for normality and homogeneity. Normality test results showed that each sample comes from a normal distributed population. Homogeneity test results also showed that the population has had a homogeneous variance.

After the test prerequisites are fulfilled, tested the hypothesis using two ways variance analysis with different cell with significance level of 5%. As for the results two-way analysis of variance calculation with different cell presented in the following table.

Table 1
Results of Two-Way Variance Analysis with Different Cell

Source	JK	dK	RK	F_{obs}	F_{table}	P
Method (A)	183,569	1	183,569	1,329	4,016	> 0,05
Learning Activeness (B)	2392,754	2	1196,377	8,665	3,165	< 0,05
Interaction (AB)	243,818	2	121,909	0,883	3,165	> 0,05
Galat	7594,296	55	138,078	-	-	-
Total	10414,437	60	-	-	-	-

Based on the calculation of variance analysis of two different cell with significance level of 5% was obtained F_{obs} = 1,330 < F_{table} = 4,016, then the H_{0A} accepted its means there is no significant effect between the student who are subjected guided discovery learning methods with the student who are subjected conventional teaching methods to the mathematical representation ability. Implementation of the conventional and guided discovery method are equally well-received by the student because basically student have good mathematical ability early and balanced. However, the limited frequency researchers in applying the method of guided discovery in the experimental class then the effect of implementation guided discovery method did not seem significant to the achievement of the mathematical representation ability.

Researchers found some facts in the field that some of the the student have not been able to follow the lessons with guided discovery method. Some student more easily and understand the lecture method (conventional) usually they get. The student still familiar listening to the teacher gives the formula that will be given in front of the class, whereas when student are given the opportunity to freely investigate and draw conclusions still many of them are not enthusiastic to perform invention activities. In addition, some student still have not been able to use the ideas, concepts and skills they have learned to discover new knowledge that student have not been able to conjecture, intuition and experimenting (trial and error) in discovery activities. On this guided discovery learning methods the learning time is going to be longer so that some student become not focused and even some student who from the beginning are not familiar with this method will become saturated, it is similar to the opinion of Markaban (2008: 18) that for certain materials are consumed over a long time and not all student can follow the lessons in this way, in the field some student are still unfamiliar and easily understood with the lecture method.

These conditions led no effect on the implementation method of guided discovery mathematical representations capabilities in mathematics learning student of 3rd Colomadu Junior High School. Although in the results of the research there was no significant difference between implementation guided discovery and the conventional method, but the average results showed that the achievement of mathematical representation ability of the experimental class is higher than the

control class. So that the implementation the conventional and guided discovery method well received by the student because basically the student have good and balance mathematical skills.

The results are consistent with the results of research by Nafiatun (2012) about the implementation of problem-based learning and inquiry-based learning approach to the mathematical representation ability of 8^{th} grade junior high school learners which states that there is no difference in the ability mathematical representation of learners who got learning with PBL approach and who got IBL learning approach.

The next interpretation results in Table 1 showed that H_{0B} rejected, it is necessary to do multiple comparison test. Before that it is need to determine the marginal average and the average each cell. As for the calculation results of the data average presented in Table 2 as follows.

Table 2

Marginal Average Data

Method	Learning Activeness			Marginal Average
	Low (b1)	Medium (b2)	High (b3)	
GD (a1)	72,25	68,654	87,857	76,254 (A1)
Conv (a2)	67,727	70,536	79,583	72,615 (A2)
Marginal Average	69,989 (B1)	69,595 (B2)	83,720 (B3)	

After got the marginal average data, performed multiple comparison (advanced test) using Scheffe method with a significance level of 5%. The details of the multiple comparison calculation results presented in Table 3 as follows.

Table 3

Multiple Comparison Result

H_0	F_{i-j}	F_{table}	$(q-1) \times F_{tabel}$	p
$\mu_1 = \mu_2$	0,053	3,165	(2)(3,165) = 6,330	> 0,05
$\mu_2 = \mu_3$	50,721	3,165	(2)(3,165) = 6,330	< 0,05
$\mu_1 = \mu_3$	43,859	3,165	(2)(3,165) = 6,330	< 0,05

Based on Table 3 multiple comparison results can be interpreted as follows: (1) $F_{1\text{-}2} = 0.053 < 2 \times F_{table} = 3.165$, then H_0 accepted meaning there is no difference the student's achievement mathematical representations ability between low and medium student's learning activeness categorized (2) $F_{2\text{-}3} = 50.721 > 2 \times F_{table} = 3.165$, then H_0 is rejected means that there are differences the student's achievement mathematical representations ability between medium and high student's learning activeness categorized. By comparing the marginal average for student medium categorized is 69.595 and the marginal average for student high categorized is 83.720 it is concluded that mathematical representation ability achievement of high student's learning activeness category better than medium student's learning activeness category (3) $F_{1\text{-}3} = 43.859 > 2 \times F_{table} = 3.165$, then H_0 is rejected means that there are differences the student's achievement mathematical representations ability between low and high student's learning activeness categorized. By comparing the marginal average for student low category is 69.989 and the marginal average for student high categorized is 83.720 it is concluded that mathematical representation ability achievement of high student's learning activeness category better than low student's learning activeness category.

In reaching mathematical representation ability the student are given the opportunity to present their own representation, so that student are able to reason and construct continuously while teachers just help provide advice and situations that student can pass the construction process. The condition causes the influence of high student's learning activeness categorized to the mathematical representations ability in mathematics learning student of 3rd Colomadu Junior High School. The results are consistent with the results of research Ariani (2014: 77) that the student 's learning activeness have a significant influence on the results of student' s mathematics learning. According to Sanjaya (2013: 142) student's learning activeness led to the involvement of student both physically, mentally, emotionally and intellectually in any learning process.

The last interpretation result of table 1 is, $F_{obs} = 0.883 < F_{tabel} = 3.165$, then H_{0AB} accepted meaning there is no significant effect of the interaction effect between teaching methods and student's learning activeness to the mathematical representation ability. It is means there is no interaction effect between the use of

guided discovery methods and student activity to the mathematical representations ability at student of 3rd Colomadu Junior High School. These conditions are presented in Table 4 and Figure 1 as follows.

Table 4

The Marginal Average Mathematical Representation Ability and Student's Learning Activeness

Class	Learning Activeness			Marginal Average
	Low	Medium	High	
Experimental	72,25	68,654	87,857	76,254
Control	67,727	70,536	79,583	72,615
Marginal Average	69,989	69,595	83,720	

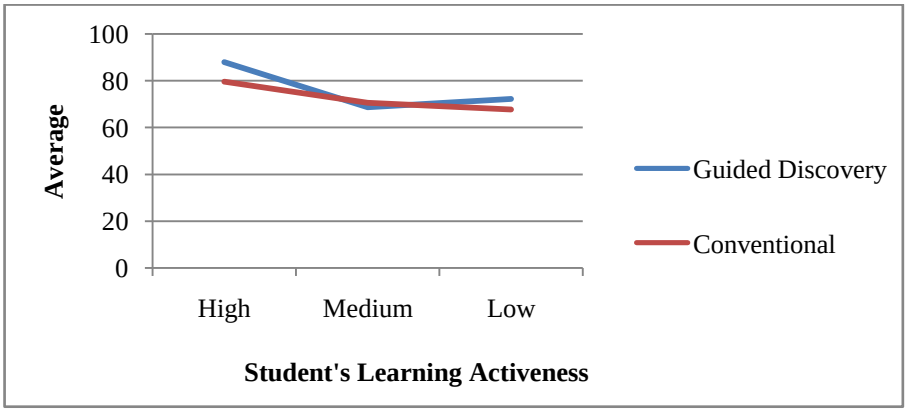

Figure 1

Graph of Profile Effect Variable Learning Methods

Based on the figure 1 it can be seen that the profile of guided discovery methods intersect with the profile for the conventional method, but the intersection does not mean any significant interaction between the variables of the activity of learning and teaching methods because according Budiyono (2009: 222) the presence or absence of interaction (significant) remains to be seen from the significance of interaction in the analysis of variance.

Both guided discovery methods and conventional methods, high student's learning activeness category has the achievement mathematical representations

ability better than the medium and low student's learning activeness categorized, medium student's learning activeness categorized has same achievements mathematical representation ability with low student's learning activeness category. This is supported by Hendra (2013) which states that the activity of learning is very important in learning process to facilitate students in achieving the learning objectives that have been established by the teacher. Thus, the higher student's learning activeness better the achievement of student's mathematical representation ability. This proves that there is no interaction between learning which applying the method of guided discovery and student's learning activeness to the student's mathematical representations ability.

CONCLUSION

Based on the results of research and discussion described previously can be concluded that: (1) There is no effect of the implementation of guided discovery and conventional learning methods to the student's achievement of mathematical representation ability in 3rd Colomadu Junior High School because F_{obs} = 1,330 < F_{table} = 4.016 (2) There is an effect student's learning activeness to the student's achievement of mathematical representations ability in 3rd Colomadu Junior High School because F_{obs} = 8.678 > F_{table} = 3.165. High student's learning activeness category has the achievement of mathematical representation ability better than medium and low categorized student's learning activeness. Likewise with achievements mathematical representation ability of the medium student's learning activeness categorized as good as low student's learning activeness category (3) There is no interaction effect between teaching methods based on student's learning activeness to the student's achievement of mathematical representations ability in 3rd Colomadu Junior High School because F_{obs} = 0.883 < F_{table} = 3.165.

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