

## THE EFFECT OF GUIDED DISCOVERY LEARNING METHOD TOWARD STUDENTS' ABILITY IN UNDERSTANDING MATH CONCEPT

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### ABSTRACT

One of the most important abilities in learning mathematics for elementary students is understanding math concepts. However, elementary students' ability to understand the math concepts in Padang is poor. The reason behind the problem is caused by inappropriate learning methods used by teachers, such as memorization. Based on this problem, the researchers conducted experimental research using *guided discovery learning* methods to overcome the problem and identify its effects on the students' ability to understand math concepts. The populations are all elementary students at grade 5 in Padang who were enrolled in group V, Kuranji sub-district, semester II academic year 2017/2018. The sample selection is done by random sampling. The experimental class is grade 5 students at elementary school 44 Kalumbuk and control class is grade 5 students at elementary school 20 Kalumbuk, Padang. The data are obtained from the initial ability tests and questions in understanding math concepts. The data are analyzed using the t-test and two-way ANOVA for interaction. The results of the analysis show that: (1) *guided discovery learning* methods is better than conventional learning, (2) students' math concepts understanding with high and low initial abilities taught by *guided discovery learning* method gets better result compared to conventional learning, and (3) there is no interaction between learning through *guided discovery learning* method and initial abilities in influencing students' ability to understand math concepts.

**Keywords : Guided Discovery Learning, Math Concept Understanding**

### INTRODUCTION

Developments and changes in science and technology, social/cultural attitudes and behavior, government/trade management, and competition occur quickly everywhere in various aspects of life. One of the aspects that is seriously affected

is math education. Therefore, Muhsetyo (2011) said that math education must adapt the needs and challenges that related to science and technology advancement. Mathematics as one of the subject areas has a great influence on various joints of life. Susanto (2014) revealed that math can improve thinking and arguing ability, problem-solving, and it can also provide support in the development of science and technology. Akanmu (2013); Hermon (2015) stated that without math, some areas like science, commerce, industry, the internet, and even global economic infrastructure mean nothing. Therefore, math as a basic science needs to be well mastered by students starting from elementary school level, especially in understanding its concepts.

Concepts understanding as one of the goals of math learning is defined by Lestari (2015) as the students' ability to absorb and understand math concepts and ideas. It is very important because math is an abstract, hierarchical, and interrelated concepts. If the students understand one concept, then understanding another concept will be easier for them. In addition, math understanding is the basis for thinking in solving math and everyday life problems. Some problems need to be concerned too, such as the low percentage of passing in national exam, Program for International Student Assessment (PISA) rank in 2015, and TIMSS (Trend in International Mathematics and Science Study) study in 2015. It results that Indonesian to be ranked 69 out of 76 countries surveyed (2015). Then, the center of Educational Research Assessment and Development (2015) also reported that math scores of Indonesian students were in the order of 45 out of 50 participating countries. In conclusion, to overcome these problems some efforts need to do, for instance, applying comprehensive learning method for math.

One of the learning methods that can be applied in learning math is *guided discovery learning*. It is a learning method that can help to develop and improve the students' math concepts understanding. It has been used as an alternative way to improve the students' mathematical abilities in some countries such as Nigeria, Akanmu, (2013); Lasisi, (2016); Philippines, Luzviminda (2015); Saudi Arabia, Saleh (2108); Indonesia, Yuliani, (2015); Maarif, (2016); and Danial, (2017); and Iran, Gholamian, (2013). The results showed that the mathematical abilities of the students taught by using *guided discovery learning* were better than conventional teaching. This

result means that the use of the method is more effective than conventional learning methods on student learning outcomes.

The *guided discovery learning* method is a learning method in which students acquire knowledge that they do not know before through notification. Some or all of their knowledge is found with the help of the teacher. In this method, the teacher only acts as a facilitator, yet not as an informer. Thus, *guided discovery learning* methods can improve students' activity and make students better understand the subject matter because they experience the process of finding it themselves, and the knowledge gained will be longer remained. In addition, it gives the students meaningful learning. Hermon and Dalim (2006); Amrina's (2008) said that learning will be more meaningful if the student experiences directly what he is learning by associating more senses rather than just listening to the teacher's explanation.

The questions in this study are as follow: (1) is the students' math concept understanding using *guided discovery learning* methods better than those who use conventional approaches? (2) is the students' math concept understanding with high initial abilities who follow *guided discovery learning* methods better than those who use conventional approaches? (3) is the students' math concept understanding with low initial abilities who follow *guided discovery learning* methods better than those who use conventional approaches? (4) are there any interactions between *guided discovery learning* methods and initial abilities in influencing the students' ability to understand mathematical concepts?

## METHOD

This study was categorized into quasi-experimental research. The variables in this study were *guided discovery learning* methods and *conventional* methods as independent variables, understanding mathematical concepts as dependent variables, and the moderator variables were initial abilities that grouped into two categories, namely high and low. The design used in this study was the nonequivalent pretest-posttest control group design. The population in this study were all grade 5 elementary school students in cluster V of Kuranji Sub district, Padang. Sampling method was done using random sampling technique, in which 30 students of elementary school 44 Kalumbuk

were taken as an experimental class and 32 students of elementary school 20 Kalumbuk were taken as a control class. The instruments used to collect data were the initial ability test and understanding test of math concepts using pre-test and post-test. The tests were validated by experts who master the content of the variables to be measured. Then, the tests were in a trial to meet the validity criteria. The criteria for grouping students was based on the average value of the initial ability test of both classes, which is 63.73. The students whose grades  $> 63.73$  belong to the group of high-ability early students, while students whose values  $< 63.73$  belong to the group of low-ability early students. The data were statistically analyzed by calculating N-gain using Microsoft Excel. The difference between post-test and pre-test score was divided with the difference of ideal and pre-test score. The data obtained were then analyzed using the t-test and two-way ANOVA because they met the requirements for normality and homogeneity. The indicators of understanding the math concepts were (1) re-explaining the concepts that have been studied, (2) classifying objects based on math concepts, and (3) providing examples of the concepts learned.

## RESULTS AND DISCUSSION

The fact showed that  $t_{table} < t_{count}$  which can be mean that all of them were rejected. Therefore, the results of the test decisions were all accepted. This means that math concepts understanding of students who took part in learning with the *guided discovery learning* method was higher than students who follow learning using conventional methods. The next statistical test was a two-way ANOVA test to determine the interaction between *guided discovery learning* methods and the initial ability to influence students' ability to understand math concepts. The results showed that the existence of  $H_0$  was accepted because  $F_t 4.008$  with  $\alpha = 0.05$  was greater than  $F_h 1.67$ . That is, there was no interaction between the *guided discovery learning* method and the initial ability to influence the ability of the students in understanding math concepts.

Based on the results of the research and statistical tests above, it was known that the influence of the ability to understand the math concepts using *guided discovery learning* resulted in positive feedback. The students who taught using *guided discovery learning* method had better understanding than students who were taught using

conventional approaches. This matter happened because of the existence of meaningful learning activities with *guided discovery learning* methods so that the students can easily understand math concepts. In this method, the subject matter such as concepts and math formulas were not presented in the final form. However, the students were given the opportunity to explore their thoughts and knowledge to be able to find their own concepts and formulas learned under the guidance of the teacher.

The students were involved directly in learning activities. These activities can be an opportunity to carry out various cognitive skills and processes, starting from observing facts, identifying problems, analyzing, processing information to make conclusions. In fact, these activities can make learning to be meaningful. As a result, the concept of learning material was durable in children's memories and was not easily forgotten. They master the material well. On the other hand, the knowledge obtained can be easy to use or transfer in other situations. Hermon and Dalim (2005); Hamzah (2015) said that the *guided discovery learning* method can help students to develop inventory and mastery of cognitive skills and processes, and obtain personal or individual knowledge. Thus, it can be strong or deeply remain in the students' mind.

One of the learning materials discussed in this study was about the congruence of two planes. The *guided discovery learning* method gave the students an opportunity to explore their knowledge with the help of colorful paperboard media that had been formed into certain planes provided by the teacher. They identified the congruence of two planes and process information by discussing in peer whether the lengths of the sides and the size of the corresponding angles had the same ratio or not. In the end, they discovered what conditions to determine the congruence of the two planes. These activities were very helpful for them in understanding the concept because they did activities and directly involved in identifying and processing information in order to obtain conclusions.

In one hand, this method placed the teacher as a supervisor, not the informer. The supervision provided by the teacher was in the form of questions contained in students' worksheets given directly to the students during the learning process. In addition, the researchers had also prepared various anticipations before the learning process was carried out, such as identifying students' responses to the problems

presented in their worksheet. On the other hand, conventional methods carried out in the control class focused more on teacher-centered in transferring knowledge to the students. The concepts and math formulas were given directly to them. While, the learning activities were carried out by giving an explanation, providing examples of problems, and explaining how to solve them. Lastly, the students were asked to complete the questions contained in the textbook.

## CONCLUSION

In conclusion, *guided discovery learning* method provides a better influence than the conventional method for increasing the students' ability to understand math concepts. It influences the students with high, low, and total initial abilities. There is no interaction between *guided discovery learning* and the initial ability to influence the students' ability to understand math concepts. This method does not present the subject matter both in the form of concepts and math formulas in the final form. However, the students are given the opportunity to explore their thoughts and knowledge to be able to find their own concepts and formulas learned under the guidance of the teacher to make learning becomes meaningful. As a result, the concept of learning material is durable in children's memories and was not easily forgotten. They master the material well. On the other hand, the knowledge obtained can be easy to use or transfer in other situations.

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