INCREASING OF MATHEMATICHAL PROBLEM SOLVING ABILITIES HIGH SCHOOL STUDENTS THROUGH GUIDED DISCOVERY LEARNING AT SMA NEGERI 1 AIR JOMAN

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Abstract

This type of quasi-experimental research aims to determine the increase in mathematical problem solving that occurs in students who are given guided discovery learning and conventional learning. The population in this study were all students of SMA 1 Air Joman Asahan District with students from two classes X X-2 and X-3 respectively. Students' initial mathematical abilities are classified according to the value of report cards. The instrument used consisted of mathematical problem solving tests. The results showed that increasing of problem solving abilities of students taught with guided discovery learning was higher than the mathematical problem solving abilities of students taught with conventional learning. This is seen from the N-gain experimental class (using guided discovery learning) of 0.14 and the N-Gain control class (using conventional learning) of 0.13. The interaction between learning and initial abilities is known that these factors do not contribute simultaneously to increasing of mathematical problem solving abilities.

Keywords: *Guided discovery learning, mathematical problem solving abilities.*

A. Introduction

Education is an effort in developing and increasing self potential, so that it can support one's future life. Therefore, everyone must take the world of education. The development of the world that is rapidly and rapidly in various fields demands that the formation of human resources that are critical, innovative, and have high ability to solve problems in each new situation encountered. This is very likely to be raised in mathematics learning.

Similarly, the expected goals in mathematics learning by NCTM (2000: 7) establish five standards of mathematical abilities that must be possessed by students namely mathematical communication, mathematical reasoning, mathematical problem solving, mathematical connections, and mathematical representations.

The same thing was also stated by Cornelius (in Abdurrahman, 2009: 253) that there are five reasons for the need to learn mathematics because mathematics is: 1) a means of thinking that is clear and logical; 2) means to solve everyday life problems; 3) the means of recognizing patterns of relationships and page generalization; 4) means to develop creativity; and 5) means to increase awareness of cultural developments.

The aim of mathematics subjects in secondary education based on Permendiknas No. 22 concerning the standard content of mathematics subjects is as follows: 1) understanding mathematical concepts, explaining the interrelationships between concepts, and applying concepts or algorithms flexibly, accurately, efficiently, and precisely in problem solving; 2) using reasoning on patterns and traits, making mathematical manipulations in making generalizations, compiling evidence, or explaining mathematical ideas and statements; 3) solving problems that include the ability to understand problems, design mathematical models, complete models, and interpret solutions obtained; 4) communicate ideas with symbols, tables, diagrams, or other media to clarify the situation or problem; 5) having an attitude of appreciating the usefulness of mathematics in life, that is having curiosity, attention,

and interest in learning mathematics, as well as being tenacious and confident in problem solving.

Based on the description, problem solving ability is an important ability developed and must be possessed by students in mathematics learning. Therefore mathematics learning has an important contribution to the development of problem solving abilities in each individual student so that it becomes a quality human resource.

But mathematics is often regarded as a science that only emphasizes the ability to think logically with a single and definite solution. This is what causes mathematics to be a subject that is feared and shunned by students. So it is not surprising that many students are not happy with mathematics because it is caused by the difficulty of understanding mathematics. This causes the mathematical ability is still low.

Mathematical learning has not given much attention to developing problem solving skills. In fact, these two abilities are very important, because in everyday life everyone is always faced with various problems that must be solved by students to find solutions to the problems faced. Problem solving capabilities enable us to overcome life's challenges.

Therefore, problem solving ability is an important one for students in mathematics learning. To be a good problem solver, students need many opportunities to create and solve problems in the field of mathematics and in real-world contexts.

Suryadi, et al (in Suherman, et al. UPI, 2003: 83), stated that: "mathematical problem solving is one of the mathematical activities that are considered important by both teachers and students at all levels from elementary to high school". But this is considered to be the most difficult part of learning it and for the teacher in teaching it. A problem usually contains a situation that encourages someone to complete it, but does not know directly what must be done to solve it.

From some of the opinions above, it shows that problem solving ability is a very important factor that must be developed on the cognitive level of students and influence the results of student

mathematics learning. The mathematics learning outcomes of students of Air Joman 1 High School in class X students have not shown good results. This can be seen from the average value of the Odd Semester Mathematics Exams still below the KKM.

From the facts in the field, it shows that students still have low problem solving abilities. This was also revealed by several studies, one of which was the Atun study (2006: 66) which revealed that the acquisition of pretest scores for the ability to solve mathematical problems in the experimental class reached an average of 25.84 or 33.56% of the ideal score.

In general, learning used by teachers is conventional learning, which tends to run in the same direction, teacher-centered and less involving students in teaching and learning. In conventional learning, the teacher directly conveys the subject matter, the students only hear and record the teacher's explanation, the teacher asks, the students answer, the students work on the practice questions in the manner shown by the teacher. Students gain knowledge because they are told by their teacher and not find themselves directly.

Learning activities carried out on the target mastery of the material so that students will only remember the existing material by memorizing not understanding, and the knowledge gained will be easily forgotten. With conventional learning students are less active and this learning pattern does not instill concepts so that it does not invite problem solving abilities.

So that if students are given a different problem with the practice questions they are confused because they do not know where to start working. This means that so far our education is still dominated by the view that knowledge is a device of facts that must be memorized.

This is in accordance with the study of mathematics learning curriculum policy, there are several problems that occur in learning process in Indonesia at the high school level, namely:

a. The implementation of classroom learning is still conventional, the standard process does not yet exist.

b. Learning methods are less varied, generally still lectures and questions and answers.
c. KBM lacks activating students, still pursuing material targets.

So there needs to be a movement to make fundamental changes in mathematics education, especially from the learning model, because until now there are still so many students complaining and assuming that mathematics is very difficult, as a result they do not like math. The expression indicates that for most students, mathematics learning has not been able to improve students' problem solving skills.

For this reason, it is necessary to carry out various efforts, including improving the current model in mathematics learning conducted by teachers. Thus the selection of the appropriate learning model can arouse and encourage the emergence of student activities so as to improve students' problem solving abilities on mathematical material. From the teacher-oriented mathematics learning model to a student-oriented learning approach. So the teaching work for a teacher is not just completing a number of subject matter but the teacher must really be able to instill the concept in the hope that it can be mastered by students. One of several learning models that are thought to be able to help improve problem solving skills is guided discovery learning.

Guided discovery learning is one of the learning processes that provides opportunities for students to search for and find concepts themselves that they want to learn through a series of activity processes with guidance, direction and scaffolding that the teacher needs to give to students. The step of guided discovery learning is 6 (six), namely: presenting the situation, formulating the problem, submitting a guess / hypothesis, collecting data, testing the hypothesis, and formulating conclusions. This learning is suitable for developing basic and complex knowledge (Trianto, 2010: 89). In addition, this learning aims to help students improve problem solving skills.

Effendi (2012: 8) states that learning mathematics with guided discovery methods in improving the representation and mathematical problem solving abilities of junior high school

students is greatly improved compared to conventional learning that is usually done by teachers. This method makes students more active and independent in solving problems so that they are more meaningful for students. This method provides a better problem solving ability because students analyze, solve and conclude their own problems.

In addition to the presentation of appropriate learning can be able to improve problem solving skills, there is one thing that can be indicated to affect students 'abilities in general mathematics, namely students' initial mathematical abilities. Initial ability is the ability possessed by students before he gets learning (new material).

In connection with the spread of students who are normal in nature, it will always be found students who have high, moderate, low initial abilities. This initial ability will affect student achievement. Students with high initial abilities will get high results and vice versa. However, this is not absolutely complete. There are several factors that might change this situation where one of them could be the learning model used. In certain models it may be that low-ability students get better results than high-skilled students because low-ability students feel comfortable with the model. This situation is interesting to study with the aim to determine the extent to which the effectiveness of learning is related to students' initial abilities.

Based on this background, this study was conducted to see whether learning factors provide positive results (improvement) on mathematical problem solving abilities of high school students.

B. Method

This type of research is quantitative research with quasi-experimental models with pretest posttest control group design. The research was conducted at SMA Negeri 1 Air Joman. The population of this study was all students of SMA 1 Air Joman which consisted of 15 classes. The sample of this study was students of class X 2 and X 3 where the selection of samples was done by purposive sampling. Class X 3 as the experimental class and Class X 2 as the control class.

Data collection techniques in this study used a mathematical problem solving ability test instrument. Data obtained through tests are used to see the improvement of students' mathematical problem solving abilities and see the interaction between learning models with students' initial ability to improve students' mathematical problem solving abilities.

C. Research Finding

Effendi (2012) Conducts research on guided discovery learning. This study confirms that the learning of mathematics with guided discovery methods in improving the representation and mathematical problem solving abilities of junior high school students is greatly increased compared to conventional learning that is usually done by teachers. This method makes students more active and independent in solving problems so that they are more meaningful for students. This method provides a better problem solving ability because students analyze, solve and conclude their own problems. So that mastery of mathematics learning is better than the lecture method used by the teacher.

Husna (2013) Conducted research on problem solving abilities. This study confirms that the improvement of mathematical problem solving and mathematical communication skills of students taught through realistic mathematical approaches is higher than students taught with conventional learning.

D. Discussion

In the experimental class (guided discovery learning), students with high initial abilities have 9 people, the initial ability is there are 23 people, and the low ability there are 8 people. For the control class (conventional learning) it is known that there are 8 students who have high initial abilities, 20 moderate abilities, and 12 low ability people. Based on the t test it is known that there is no difference in the initial ability of the experimental class students and the control class.

To see an increase in mathematical problem solving abilities between experimental class students (using guided discovery learning) and control class students (using conventional learning) the normalized gain calculation was used in both classes. Normalized gain (N-Gain) was obtained from the difference in posttest scores with pretest divided by the maximum score difference (ideal) with pretest scores both in the experimental class and in the control class.

In general, the average gain for the experimental class is higher than the average gain of the control class both for students with high, medium, or low initial abilities. This means that students who are taught with guided discovery learning experience an increase in mathematical problem solving abilities than students who are taught with conventional learning. To test whether the mean difference is significant, different tests are carried out using the two path anava as shown in table below.

Table Anava Test Two Data Gain Paths Mathematical Problem Solving Ability

Tests of Between-Subjects Effects						
Dependent Variable: NGain_Pemecahan Masalah						
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1.137[a]	5	.227	6.436	.000	.345
Intercept	10.070	1	10.070	284.885	.000	.824
Pembelajaran	.789	1	.789	22.320	.000	.268
KAM	.254	2	.127	3.596	.033	.105
Pembelajaran * KAM	.010	2	.005	.139	.870	.005
Error	2.156	74	.035			
Total	16.843	80				
Corrected Total	3.294	79				
a. R Squared = .345 (Adjusted R Squared = .292)						

Based on table, it can be seen that in the learning factor, the calculated F value is 22.32 and a significant value of 0.00. Because the significant value is smaller than the significant level of 0.05 and F count is greater than F table, H0 is rejected and H1 is accepted. Thus it is known that the increase in mathematical problem solving abilities of students

who get guided discovery learning is higher than the mathematical problem solving abilities of students who get conventional learning.

The interaction test between learning factors and KAM factors was carried out using two-way Anava (summarized in table 2). The test results at the alpha level of 0.05 indicate that significantly there is no combined effect between learning factors and KAM on improving students' mathematical problem solving abilities.

Overall, there are several findings relating to the improvement of students' mathematical problem solving abilities through guided discovery learning including:

1) Most students are still unable to understand well every problem that is raised, especially the problem of problem solving abilities.
2) Students are not accustomed to learning which is constructed by constructing their own knowledge (student centered).
3) Knowledge and skills of students are still inadequate.

E. Conclusion

Increasing students' mathematical problem solving abilities taught with guided discovery learning is higher than students taught with conventional learning.

There is no interaction between learning and students' initial mathematical abilities (KAM) towards improving mathematical problem solving abilities. Increasing students' mathematical problem solving abilities is caused by learning factors used.

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