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THE EFFECT OF PROBLEM POSING LEARNING MODEL ON STUDENT'S MATHEMATIC REASONING ABILITY

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Abstract:
This research is an experimental research because the treatment is tested and its effect is measured on the sample groups. The experimental design used in this study was a non-equivalent pretest and posttest control group design. The population in this research were all students of senior high school (SMA) in Kutalimbaru in class IX which consisted of 323 students and 2 classes were randomly selected from 8 available classes. To obtain the data, an instrument was used, namely a set of mathematical reasoning tests in the form of descriptions that were valid and reliable. Furthermore, to determine whether or not there is an effect of mathematical reasoning before and a lesson, statistical analysis of the Independent Sample t-test was carried out. The results of the research show that problem posing learning significantly improves students' mathematical reasoning abilities when compared to before learning. It can be concluded that there is an effect of the problem possing learning model on students' mathematical reasoning abilities.

Keywords: Problem posing, learning models, mathematical reasoning skills.

1. INTRODUCTION

Good mathematics education will only occur if the teaching and learning process of mathematics in the classroom is successful in teaching students, both physically and mentally. Through good mathematics education, students are indeed possible to obtain various kinds of provisions in facing challenges in the global era. The ability to reason logically, systematically, critically, carefully, creatively and innovatively in communicating ideas or in solving problems are some of the abilities that can be developed through good mathematics education. Learning in the classroom is expected to refer to the implementation of a learning atmosphere for students and not an atmosphere of teaching or teacher-centered learning. What goals to be achieved by mathematics education can be classified into (1) formal goals and, (2) material goals . Formal goals emphasize more on organizing reasoning and shaping personality, while material goals emphasize the ability to apply mathematics and mathematical skills (Soedjadi, 2000).

This is in accordance with the objectives of learning mathematics formulated by the National Council of Teachers of Mathematics (NTCM, 2000), namely: (1) Learning to communicate, (2) Learning to reason, (3) Learning to solve problems, (4) Learning to linking various ideas, (5) Formation of positive attitudes towards mathematics. To achieve all of the above mathematical abilities is not an easy job. Jaworski (Depdiknas, 2006) argues that the implementation of mathematics learning is still facing various problems. The facts show that a number of students who have difficulty in learning mathematics are caused by low reasoning abilities.

Reasoning is a tool for understanding mathematics and understanding mathematics is used to solve problems (Napitupulu, 2008). In line with this, Wahyudin (1999) found that one of the weaknesses that exist in students is the lack of logical reasoning ability in solving mathematical problems or problems. Wahyudin also found that mathematics teachers generally teach by lecture and expository methods. Students only accept what is given by the teacher, students rarely ask questions to the teacher so that the teacher actively explains the material he has prepared. The ability of students' mathematical reasoning to get better requires an attitude where students no longer rely on information or subject matter provided by the teacher but students themselves are able to seek from books or other sources, one attitude in solving these problems is independent learning to find reasons from various sources. students' basic knowledge gives correct decisions (Chotimah & Bernard, 2018) besides being able to draw conclusions from how to use concepts and methods (Bernard, 2014:207). In addition, an honest attitude, independent learning, objective, systematic, and open to the development of science is the hope of learning mathematics

The reasoning process needs to be developed in learning mathematics, as stated in the primary and secondary education curriculum. The general purpose of mathematics education in schools is to emphasize the arrangement of reasoning on skills in the application of mathematics. Mathematical reasoning ability is one of the competencies that is expected to emerge as a result of learning mathematics. Mathematical reasoning is very important in achieving optimal mathematics learning outcomes. Through reasoning activities in mathematics, students are expected to be able to see that mathematics is a reasonable or logical study. Thus students feel confident that mathematics can be understood, thought about, and evaluated.

From the problems found and the expected goal is a solution, constructivism-based learning is needed, one of which is a problem posing learning model. The problem posing learning model can be classified into an activity that supports the occurrence of a student-centered learning process because by submitting questions by students it will definitely encourage student activity in learning. Asking questions by students or making their own questions is one way for students to reason mathematically. Problem posing has three definitions, namely: 1) Formulation of simple questions or reformulation of existing problems with some changes to make them simpler and can be mastered in order to solve complex problems; 2) Formulation of questions related to the requirements of the problems that have been solved in order to find other alternatives; 3) Formulation of questions or submission of questions from available situations. Furthermore, Silver and Cai (1996) suggest that problem posing is positively correlated with reasoning activities of problem solving abilities, so that it can improve students' problem solving abilities.

2. MATERIALS AND METHODS

This research is an experimental research because the treatment is tested and its effect is measured on the sample groups. In its implementation, the sample is not grouped randomly, but accepts the state of the subject as it is. The experimental design used in this study was a non-equivalent pretest and posttest control group design. The population in this study were all students of Senior High School (SMA) in Kutalimbaru in class X which consisted of 320 students and the sample was randomly selected from 2 classes from 8 available classes. To obtain the data in this study used instruments, namely a set of mathematical reasoning tests in the form of descriptions and have been valid and reliable.

In this research, data were collected through a written test which aims to determine students' mathematical reasoning abilities. The test is in the form of a description or essay which is carried out at the end of the study. The questions are adjusted to the indicators of mathematical reasoning ability. Before being used, the test questions were validated by experts. The indicators of mathematical reasoning ability according to Agustin (2016) are: 1. Analyzing mathematical situations. 2. Planning the completion process. 3. Solve problems with systematic steps. 4. Draw logical conclusions. To obtain the data in this study used instruments, namely a set of mathematical reasoning tests in the form of descriptions and have been valid and reliable. Furthermore, to determine whether or not there is an effect of mathematical reasoning before and a lesson, a statistical analysis of the Independent Sample t-test was carried out.

3. RESEARCH RESULT

This research was carried out with the help of 3 observers in charge of observing the activities of teachers and students during the mathematics learning process. The time spent on this research activity is one semester. Based on the pretest and posttest scores, it can be seen that the students' mathematical reasoning pretest scores from both classes are almost the same. This means that students' mathematical reasoning is not different. The following is table 1 which describes students' mathematical reasoning.

Table 1. Descriptive Statistics of Students' Mathematical Reasoning Data

Mathematical reasoning	**Problem Posing**				**Konvensional**			
	Min	Max	Mean	St.dev	Min	Max	Mean	St.dev
Pretest	40	75	58,33	10,6	45	74	59,17	9,3
Posttest	68	95	80,50	11	53	86	70,26	9,4

Based on Table 1 above, the mean of students' mathematical reasoning before treatment shows that both classes have relatively the same reasoning ability. This is sufficient to meet the requirements to provide different treatment for each sample class. If there is a difference in the increase in students' mathematical reasoning at the end of the learning process, then the difference can be seen as a result of different treatment in the two sample classes, not because of differences in the two sample classes before learning. If viewed based on posttest scores, the overall average achievement of mathematical reasoning students who received problem posing learning were greater than students who received conventional learning.

Based on the results of the research that has been stated above, it is clear that problem posing learning is significantly better in improving students' mathematical reasoning abilities when compared to conventional learning. Independent Sample t-test. The following is Table 2 which is the result of the Independent Sample t-test.

Table 2. Test Results of Independent Sample t-test

		Levene's Test for Equality of Variances						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Mathematical reasoning	Equal variances assumed	1.291	.264	2.189	31	.036	11.16667	5.10209
	Equal variances not assumed			3.032	2.971	.057	11.16667	3.68296

By looking at the summary of the results of the analysis in Table 2 above, the probability t value (sig.) for the two studies is smaller than the significance level = 0.05, so the null hypothesis is rejected. In other words, there are significant differences in students' mathematical reasoning in the two classes. It can be concluded that there is a significant effect of the problem possing learning model on increasing students' mathematical reasoning abilities.

If you pay attention to the characteristics of the two learnings above, then this is something that is natural because, theoretically, problem posing learning has advantages in improving mathematical reasoning and communication skills when compared to ordinary learning. Likewise, students' attitudes towards both learnings, problem posing learning has the advantage of changing students' paradigms towards mathematics learning that has been taking place so far. This study shows several advantages of problem posing learning, namely (1) learning activities are not centered on the teacher, but students are required to be active, (2) students' interest in learning mathematics is greater and students are easier to understand questions because they are made by themselves, (3) all students encouraged to be actively involved in making questions, (4) by making questions can have an impact on students' ability to solve problems, and (5) can help students to see existing and newly accepted problems so that they are expected to get a deeper and better understanding and mathematical reasoning, as well as stimulating students to come up with creative ideas from what they get and requiring discussion/knowledge, students can understand the problem as an exercise to solve problems.

4. CONCLUSION

Problem posing learning in mathematics learning that emphasizes students' mathematical reasoning abilities can be used as an alternative to apply innovative mathematics learning approaches. The research findings are based on the results of data analysis and discussion of research results that can be used as references and input for teachers who are interested in using problem posing learning in the implementation of learning in the classroom and for researchers who are interested in implementing this learning in a wider scope.

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