

THE INFLUENCE OF PROBLEM-BASED LEARNING MODEL ON THE ABILITY OF THE PROBLEM OF MATHEMATICAL STORIES

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Abstract. The purpose of this study was to determine the effect of problem-based learning models or problem-based learning models on the ability of students to solve mathematical story problems with learning material in space and flat in class 5 Panaragan State Elementary School 1, Bogor City. The approach used in this research is a quantitative approach with a quasi-experimental method. There are several techniques used in this study, namely observation techniques, interview techniques, and tests. Then obtained research results with the average difference in value between the control class and the experimental class, the experimental class has an average value of 73.11, and the control class has an average value of 60.86. After calculating the t-test (One-Sample Test) on the experimental class's post-test value, the Sign value is known. 0.04, because $0.04 < 0.05$, then H_a is accepted, and H_0 is rejected, which shows the influence of PBL models on the ability to solve students' mathematical story problems.

Keywords: mathematics; problem-based learning; question matter.

1. INTRODUCTION

Education can be interpreted as an effort made to prepare students in the face of increasingly evolving environmental changes. To create education that can change students to be ready to face increasingly rapid environmental changes, one of which can be to provide or create an interesting learning process by using various learning models that are tailored to student needs. As quoted in the National Education System Law No. 20 in 2003 in Chapter, I article 1 (Paragraph 1) which states education is a conscious and planned effort to create an atmosphere of learning and learning process so that students actively develop their potential to have religious, spiritual strength, self-control, personality, intelligence, noble character, and the skills needed by himself, the community, the nation, and the country. Implementation in learning activities is very influential in the achievement of educational goals. The magnitude of the role of educators during the learning process in providing demands that education is able to create an interesting learning atmosphere and adapted to the needs of students so that students can easily develop their potential. This is explained in Law No. 20/2003 concerning the National Education System in article 3, which states that national education functions to develop capabilities and shape the dignified character and civilization of the nation in the context of the intellectual life of the nation.

Various educational activities can be carried out in schools as formal institutions that have a very important role in providing an appropriate education for students. The more intelligent the

students, the more developed the potential of their nation will be. The elementary school is the first basic education that is very determining students to continue their education. One component found in elementary school is mathematics. Mathematics introduced in elementary school is in the form of number recognition and how to count numbers that can be used in students' daily lives or activities so that by studying mathematics, students will be able to solve the problems they face.

The challenge that must be faced by teachers in teaching mathematics is by creating a learning atmosphere that can attract students' interests and not be boring in order to eliminate the negative impressions of students in mathematics. A learning atmosphere that can attract students' attention can be created by using models, methods, techniques, and learning strategies, and linking learning to students' real lives.

Based on observations and results of interviews conducted, found problems that occur in students during learning activities, namely the lack of understanding of students to solve mathematical story problems, especially in the form of questions that cause the student learning outcomes are still low, especially in class 5C Panaragan State Elementary School 1, the learning outcomes are still very low when compared with the learning outcomes of other subjects. The presentation of learning outcomes from mathematics in 5C grade students in Panaragan 1 Elementary School, namely students with learning outcomes less than KKM, is 58%, and students with learning outcomes less than or equal to KKM is 42%. This is due to less optimal learning processes and activities carried out by teachers with a less varied learning atmosphere in using mathematical learning models, and teachers more often apply Contextual Learning with the reason that they can link learning with daily activities or the real world of students. Meanwhile, the problems found in students in the learning process are the lack of interest, and there are still many students who are less active during the implementation of learning activities, as well as the students' lack of understanding of how to do math story problems with the right steps.

Based on information taken from observations and interviews with 5th-grade teachers at Panaragan 1 Elementary School held on Saturday, January 27, 2018, that students have not been able to solve mathematical story problems optimally. Learners' mistakes when filling in the questions are seen in the wrong placement in adding and subtracting numbers so that students answer with incorrect answers. In addition, students are also not able to understand the purpose of the story problem, so students do it in an inappropriate way.

Types of errors that can be seen from the pictures in these are operating errors and principle errors. Operation errors are errors in carrying out operations or calculations; in the problem, there are operations errors made by students in the answer section in subtracting numbers. Principal error is a mistake made by students in using mathematical formulas or rules that should be done with subtraction operations, but in its completion, students make mistakes with additional operations. The percentage of students' mistakes when completing story questions in mathematics are: 1 out of 5 students answered with the right answer with a percentage of 20%, 3 out of 5 students made a principle error with a percentage of 60%, and 1 out of 5 students solve problems with operating errors with a percentage of 20%. These mistakes ultimately result in incorrect answers.

Based on the results of research by Wafik Khoiri, Rochmad, Adi Nur Cahyono with the research title "Problem Based Learning Assisted Multimedia in Learning Mathematics to Improve Creative Thinking Ability" conducted at students of SMP Negeri 4 Kudus in class VII in the 2012/2013 academic year, in research This delivery of flat figure material is done by applying a problem-based learning model. In this study, the application of the problem-based learning model in learning activities can improve students in creative thinking when answering questions with the subject matter build flat. The ability of students to think creatively is very necessary when students are going to solve math story questions.

The ability of Panaragan 1 SDN grade V students to complete math story problem questions is still very low and has not yet achieved the expected results. The activeness of students in the learning process or activity is also still lacking, thus making the classroom atmosphere passive. This can happen because mathematics learning material is very difficult, especially in the matter of stories, and there are still many teachers who have not been able to create a learning process that can attract the attention of students.

Therefore, it is necessary to improve and change the learning process that is more interesting and in accordance with the characteristics of students so that students are able to solve mathematical story problems to the full. Improvement of the learning process can be made by applying the mathematics learning model that is PBL in the form of a story so that it can achieve the expected learning goals.

The core activity of the problem-based learning model of learning is to provide a problem for students to then conduct investigations and investigations as well as present results and conduct evaluations to solve mathematical story problems in an appropriate manner.

In its implementation, the problem-based learning model is the right and creative solution in problem-solving efforts. The solution in this learning is done by instilling several characters, including creative attitude, fostering self-confidence, the courage to express opinions, and enhancing the attitude of cooperation in planting the characters needed to facilitate students in solving mathematical story problems.

From this description, it is hoped that the PBL model can improve the ability of students to solve math story problems. This study aims to determine and prove the influence of PBL models on students to solve math problem story questions for 5th-grade students at Panaragan State Elementary School 1.

2. METHODS

The method in this study uses quantitative methods, with the application of research designs *Non-Equivalent Control Group Design*. In this study, there were two groups with one experimental group and one control group. Two groups were given a *pretest*, then the experimental group was given treatment in the form of a PBL model, and finally given a *posttest*. Meanwhile, the data collection techniques that will be carried out in this study are interviews, observation, and tests. Data analysis techniques used in this study were prerequisite tests of data analysis with normality

tests and homogeneity tests, after which a statistical hypothesis test was performed with a *one-sample t-test* and was carried out with the help of SPSS 16.0.

3. RESULTS AND DISCUSSION

3.1 Results

Research data in the form of data *pretest* & *posttest* class VC (experimental group) and class VA (control group) are then described in the following table.

Table 2. Descriptive analysis students' ability in solving math story

Value	<i>pretest</i>			
	Eksp Posttest.	Kont.	EXP.	Kon.t
average	51.52	54.22	73.11	60.86
Max Score	60.00	60.00	97.00	85.00
Score Min	40.00	20.00	60.00	30.00

Based on the above table, the ability of students to solve math problem story questions on the result data *pretest* and the result data *posttest* in the VC class (the experimental group) experienced a higher average value when compared to the average grade of the VA class (control group). After *treatment* in the form of applying PBL models, the experimental class experienced an average increase of 21.59, while the control class only increased by 6.46.

Prerequisites Data Analysis Prerequisites

Data Results Prerequisites of data are carried out with a normality test and a homogeneity test. This normality test uses the Kolmogorov-Smirnov Test formula and uses the help of an SPSS 16 computer program. The hypothesis used is:

H_0 : the population data is normally distributed.

H_1 : population data is not normally distributed.

With the decision criteria: H_0 accepted if the p-value. (sig) > α , with $\alpha = 0.05$. Table 3 shows the description of the normality test *posttest* in the experimental class and the control class.

Table 3. Test for normality

	One-Sample Kolmogorov-Smirnov Test	
	Class Experiment	Class Control
N	33	33
Asymp. Sig. (2-tailed)	.428	.267

a. Test distribution is Normal.

Test for normality From the table, it is obtained that the value of the VC class (experimental class) is normally distributed with a value of $0.428 > 0.05$.

Then homogeneity test is performed to determine whether the data has homogeneous variance or not. Homogeneity testing was carried out in the students' pretest scores and post-test of VC grade students (experimental group) and VA classes (control group). The hypothesis is:

H_0 : $s_1^2 = s_2^2$ (experimental and control group data has homogeneous variance).

H_a : $s_1^2 \neq s_2^2$ (ie VC-class data as an experimental group and a control group VA classes have variances are not homogeneous).

The statistics used are *one-way ANOVA homogeneity of variances test* contained in the SPSS computer program. Decision criteria: H_0 is accepted if $p\text{-value} > (\text{sig}). \alpha$, with $\alpha = 0.05$. The results obtained from the calculation of SPSS 16 are $0.075 > 0.05$, so the data can be concluded to be homogeneous. Test results are shown in Table 4.

Table 4. Homogeneity Test of Homogeneity of Variance

Class Experiment	Levene Statistics	df1	df2	Sig.
	2,343 ^a	7	16	.075

a. Groups with only one case are ignored in computing the test of homogeneity of variance for the Experiment Class.

3.2 Discussion

Ward et al. state that Problem Based Learning (PBL) is an instructional model that involves students solving a problem through the stages of the scientific method so that students can learn the knowledge related to the problem and, at the same time, have the skills to solve problems. It can be said that according to the theory, the learning process or activities that apply the PBL model has an influence on students' ability to solve math problem story questions because if they do math problem-solving questions according to Polya students must have some abilities such as, ability to write aspects what is known, the ability to write aspects that are asked, the ability to make mathematical models, the ability to solve mathematical models, and the ability to answer questions about questions. PBL model by presenting the problem-solving process with scientific stages can help students improve the abilities needed when students solve math problem story questions.

The learning activities carried out in this study were conducted five times for VC (experimental group) and VA (control group) classes. The first meeting the researchers gave a pre-test as many as four math story questions, while the next three meetings conducted learning activities, and at the fifth meeting, the researchers gave a post-test of six math story questions for each VC class (experimental group) and VA class (control group). Pre-test questions given to students are material about flat construction and material about building space that has previously been studied with the class teacher while giving posttest in the form of 6 math story questions about flat building material and material about building space that has been carried out in learning activities one to three.

Applying PBL models in class VC (experimental group) is very influential on the ability of students when solving math problem stories, especially with teaching material in flat shapes and building spaces, it can be seen by the difference in the average score of students' results in problem-solving -the story about math lessons in VC class (experimental group) and VA class (control group). The mean value of the VC class (experimental group) was 73.11, and the average value in the VA class (control group) was 60.86. From the differences in the average value, it can be concluded that the ability of students in the experimental group when solving math problem story

questions shows more results when compared with the ability to select students in the math problem story questions in the control class. With an average difference that is quite far, namely 12.25.

The minimum value of the VC class (experimental group) is 60.00 while the minimum value in the VA class (control group) is 30.00, if related to the minimum graduation criteria value (KKM = 70) in Panaragan 1 Elementary School, the number of students who successfully complete the questions about the story of mathematics in the VC class (experimental group) there were 26 people out of 33 students while in the VA class (control group) there were only 12 out of 33 students.

According to the researchers' analysis, it appears that there are significant differences between VC grade students (experimental group) and VA grade students (control group) in solving math problem story questions because the application of the PBL model with flat building instructional materials and building construction teaching materials in VC classrooms (experimental groups) can create learning processes or activities that can be of interest to students. The atmosphere in the class has changed to become more conducive; students have become more enthusiastic, active, creative, and can collaborate well.

Based on the results of preliminary observations and the provision of pretests in the 5C grade at Panaragan 1 Elementary School, it is known that the ability of students when completing story questions is still very low because there are still many students who do not understand how to solve math problem story questions and have an assumption that mathematics is one of the most difficult lessons to learn. In contrast to the ability of students when completing math problem story questions that apply the PBL model in the VC class (experimental group) is included in a good qualification, this means that the ability of students to understand questions and solve problems in math story problems it's very good. Applying the PBL model is one creative solution that is able to create a very interesting learning atmosphere for students. Although PBL models are more widely used in schools with higher levels than primary schools, teachers can modify PBL models with learning steps that can be adjusted to the characteristics of elementary school students. In this case, the researcher modifies the learning steps without eliminating or changing the steps in the PBL model.

Modifying the steps of learning activities more interestingly for students is not a difficult thing, but it is also not an easy thing, it needs creativity and a strong desire of a teacher to be able to create learning activities that are interesting and in accordance with student needs. The application of the PBL model can also train students' creativity and critical attitude when solving problems they face because the forms of problems in the PBL model are problems that exist or are related to the environment around students so students can more easily solve the problems they have. In addition to using the final test, the study conducted interviews, observation, and documentation techniques as research techniques.

The theory states that in learning to solve mathematical story problems, students are required to be able to solve problems with their ability to understand questions, design, and solve these story questions, meaning that when learning activities are carried out, they must be able to practice

their abilities and provide direct learning in solving student problems. Learning by applying PBL models in class VC (experimental group) shows the fact that the learning outcomes have shown a pretty good ability when solving math story problems in the form of surrounding problems. This can be seen from the way to solve the problem by working together well and mutual respect for opinions. The success of the achievement of objectives in learning activities by completing the questions of the mathematics lesson is influenced by various factors, one of which is the learning process created by the teacher's student interest in mathematics. The right process of learning activities will foster students' interest in learning so students will become more focused and understand learning material more easily.

As for the students' activities in understanding the solution of the mathematics lesson story problems, namely the division of worksheets for each study group, in the activity, each group is given a number of questions with different problems, and each group is required to be able to solve the problems in these questions by experimenting to be able to prove the accuracy of the answers discussed. Experiments carried out in each learning activity are different, in the first learning activity, students conduct experiments by making a flat figure out of colored paper and then affixed to the answer paper, while in the second and third learning students conduct an experiment by making their own drawings of shapes and shapes and shapes. In the next problem-solving process, students are given the understanding to solve it by writing down aspects that are known, asked, and answered. After that, each group is required to present the results of the discussion, while the researcher, along with other students, provides responses and conclusions for each group presentation that has been carried out. At the end of the activity, the researcher conducts questions and answers and provides opportunities for students to ask questions about material that they have not yet understood.

The benefits of applying the results of the PBL model during learning activities are that it can foster interest and motivation to learn them so that mathematics can be considered as a fun lesson. Just as mathematical learning theories have been seen in the experimental class, after participating in learning, students have increased by being able to understand the activities or activities during learning and then apply to their real life. Students are able to understand problems, use appropriate and appropriate ways to solve them, and are able to solve these problems with good solutions. Researchers choose to apply problem-based learning as a model that is applied to learning activities carried out in 5C grade students because the model is very in accordance with the characteristics of students.

The application of PBL models in VC class (experimental group) is very useful and is the same as existing theories, one of which is that the PBL model helps the transfer process of students in understanding every problem in their real life and can make the process of learning activities become very interesting because the teacher succeeds in creating learning activities or environments that are more fun and preferred by students.

From all of the above explanations, it can be understood that learning activities in mathematics with flat building teaching materials & building teaching materials by applying PBL models chosen by researchers can be used as one of the solutions or alternatives to create an

appropriate learning process or activity to help improve students to solve mathematical story problems.

4. CONCLUSIONS

The effect of problem-based learning models can be seen in students when students solve mathematical problems with flat instructional materials and building instructional materials in class 5 Panaragan State Primary School 1. PBL Models can be used as a solution or alternative in creating appropriate learning processes or activities because the PBL model can help students to improve their ability to solve math problem story questions. In order for this PBL model to be used at the elementary school level, the steps in implementing this learning model can be modified or adjusted to the characteristics of students in elementary school.

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