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Effect of The Application of The Problem Based Learning Model to The Mathematical Problem Solving Ability

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abstract

EFFECT OF THE APPLICATION OF THE PROBLEM BASED LEARNING MODEL TO THE MATHEMATICAL PROBLEM SOLVING ABILITY. This research is motivated by the low mathematics learning outcomes in terms of the results of daily mathematics tests of students of class XI MIPA SMAN 1 Sungai Limau. The results of these tests are influenced by the low ability of students to solve mathematical problems and the inability of students to solve non-routine problems. This study aims to determine whether there is an influence of the application of the Problem Based Learning (PBL) model to the mathematical problem solving ability of students of class XI MIPA 1 of SMAN 1 Sungai Limau. Data collection techniques used are by giving a description test in the form of pre-test and post-test. Analysis of test data containing indicators of the ability to solve mathematical problems using the t-test. The calculation results obtained t-value = 5,57 with N = 30 and α = 0,05. While t_{tabel} = 1.70, $t_{hitung} > t_{tabel}$ then reject H_0. So, it can be concluded that there is an effect of the application of the Problem Based Learning (PBL) model to the mathematical problem solving ability of students of class XI MIPA 1 of SMAN 1 Sungai Limau.

Keywords:
Problem Based Learning, problem solving skill, learning methods.

INTRODUCTION

Mathematics is a very important field of science in the development of science and technology. There is no other science that can be separated from the role of mathematics (Hendriana, Rohaeti & Sumarmo, 2017). Chemistry, Biology and Physics require mathematics in calculations for example, calculating the distance of atomic trajectories, determining periodic numbers, calculating pH and reaction rates of chemical mixtures. In Biology, mathematics calculates the percentage of albino people, and genes of sex sequences. In mathematical physics, it is necessary to calculate the angle of inclination in an area as well as the speed and acceleration and calculate the elliptical circulation distance. One of the goals of learning mathematics in the world of education is to solve problems, solve and interpret solutions (Permendiknas, 2006). This is what underlies the importance of mathematical problem solving skills. Polya (1973) argues that problem solving is an attempt to find a way out of a goal that is not so easy to achieve immediately. Indicators of problem solving ability according to Polya are, (1) Understanding the problem, (2) Planning a solution, (3) Carrying out a solution, (4) Re-checking the answers.

The results of observations at SMAN 1 Sungai Limau, on 11 February 2019 - 25 February 2019, showed that the learning process was still centered on the teacher. There are still many students who have not paid attention to the teacher's explanation because of a lack of curiosity from within the students. This can be seen when students do not want to ask if there is material that is not yet understood, do not want to read sources other than books, and do not ask questions related to the subject matter. When the teacher gives examples of questions and the teacher asks whether or not the students answer understand, but if the teacher gives a second form of question that is different from the sample questions students begin to be confused to solve the problem because students are fixated by the teacher's completion. So students are not accustomed to solving non-rotin problems that have not yet resulted in an increase in problem solving abilities. These activities cause students to focus less on learning, and the atmosphere created in classrooms is less conducive (Muliyardi, 2002).

The results of interviews with mathematics teachers at SMAN 1 Sungai Limau obtained information that students were less motivated in learning mathematics. The teacher states that there are still many students who have difficulty working on problems that are different from the example problems, and students are confused about solving the problems. The teacher also stated that the students 'lack of curiosity caused weak problem solving abilities and the students' problem solving skills were not honed (Walpole, 1992).

The results of interviews with several students of class X MIPA SMAN 1 Sungai Limau obtained information that students stated it was difficult to learn mathematics because mathematics is always related to formulas, must be memorized so that it is difficult to understand, so students more often copy the work of friends who have finished. This means that students are accustomed to memorizing rather than understanding the material provided so that when solving problems students find it difficult to solve problems because they do not understand the problem first. Students do not want to express opinions because of fear of being wrong, students do not want to ask questions because they are ashamed, and are not confident. This

makes students passive in learning mathematics so that students do not understand the material provided. The teacher as the holder of an important role in learning, is expected to be able to create learning conditions that can actively involve students and be able to improve students' mathematical problem solving abilities. One alternative can be done by applying the Problem Based Learning (PBL) model (Lie, 2010). Moffit in Rusman (2010) argues that problem-based learning is a learning approach that uses real world problems as a context for students to learn about critical thinking and problem solving skills as well as to gain knowledge and concepts of essence from subject matter. Ibrahim in Suprihatiningrum (2013) argues that PBL steps are as follows:

Table1
PBL Model Steps

Phase	Teacher Behavior Stage
Phase 1 Student orientation to problems	The teacher explains the learning objectives, explains the logistics needed, proposes phenomena or stories to bring up problems and motivates students to be actively involved in solving selected problems
Phase 2 Organizing students for problems	Teachers help students define and organize learning tasks related to the problem
Phase 3 Guiding individual and group investigations	The teacher encourages students to gather appropriate information, carry out experiments to get explanations and problem solving
Phase 4 Developing and presenting the work	The teacher helps students plan and prepare appropriate work such as reports, videos and models and helps to share assignments with friends
Stage 5 Analyzing and evaluating the problem solving process	The teacher helps students to reflect or evaluate their investigation and the processes they use

Source: Abdul-Kadir, Ibrahim, Rahim, Kamin & Yunus (2003)

The purpose of this study was to determine whether there is an influence of the application of Problem Based Learning (PBL) Model to the Mathematical Problem Solving Ability of Class XI Students of Mathematics and Natural Sciences at SMAN 1 Sungai Limau. Research that is relevant to this research is a study conducted by Saragih, Rajagukguk, & Mansyur (2018) with the title " The Influence of Problem Based Learning on The Mathematical Problem Solving And Connection Ability of Students In SMP Swasta Assisi Siantar ".

RESEARCH METHODS

This study uses a pre-experiment type one-group pretest-posttest (initial and final tests) (Arikunto, 2010). In this case, the study conducted a research design in the form of pre-test and post-test in one class (Sudjana, 2005). The study

population was all students of class XI MIPA SMAN 1 Sungai Limau. Sampling was done by purposive sampling, the selected sample was Class XI MIPA 1. The independent variable in the study conducted was the Problem Based Learning (PBL) model (Nisak, & Istiana, 2017). The dependent variable in this study was the ability of mathematical problem solving ability of students of class XI MIPA 1 SMAN 1 Sungai Limau. At the time of conducting the research by applying the Problem Based Learning (PBL) model, it was applied for 6 meetings with row and series material. The instrument used was the final test in the form of an essay. Each item pre-test and post-test contains an indicator of problem solving ability (Sugiyono, 2013). In this study, the instrument validity test is a validation sheet. In this study the validity of the test was conducted by Mrs. Rina Febriana, M. Pd, Mrs. Melisa, M. Pd, Mrs. Lucky Heriyanti Jufri, S. Si, M. Pd, and Mrs. Rahma Diana Safitri, S. Pd, M. Si. The initial test and the final test in this study were declared valid (Panjaitan & Rajagukguk, 2017).

RESULTS AND DISCUSSION

Based on research that has been done, the data obtained about students' mathematical problem solving abilities obtained through the results of pre-test and post-test in the form of essay tests consisting of 4 items that can be seen in Table 2.

Table 2. Average Values ($\bar{x}$), Standard Deviation (S), Highest Values (x_{max}), Lowest Values (x_{min}) as a result of problem solving ability of Sample Class:

Table 2
Result of Problem Solving Ability of Sample Class

LO Test	Average Values ($\bar{x}$)	Standard Deviation (S)	Highest Values (x_{max})	Lowest Values (x_{min})
Pre-test	48,10	22,24	86,36	14,00
Post-test	70,73	18,44	100,00	31,81

Based on Table 2 it can be seen that the pre-test mean value is lower than the post-test average value, so that the average calculation difference is 22.6. The standard deviation of the pre-test is higher than the standard deviation of the post-test. This shows that the pre-test scores are more diverse than the post-test scores. Based on the pre-test and post-test results, it can be said that the students' mathematical problem-solving ability at the time of the post-test is higher than the pre-test results (Sugiyono, 2001).
High ability students at the pre-test have been able to understand the problem but it is not complete. Whereas in the post-test high ability students have been able to understand the problem correctly. The following pre-test and post-test answer sheets for high-ability students are shown in Figure 1 and Figure 2

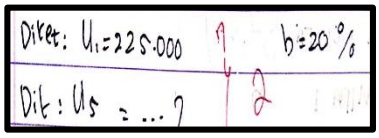

Figure 1 Pre-test Answer Sheet of high ability students

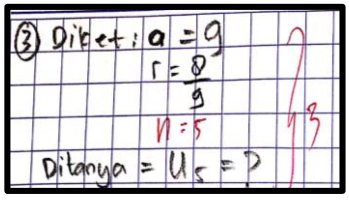

Figure 2 Post-test Answer Sheet of high ability students

Based on Figure 1 pre-test answer sheet of high ability students, it appears that students have understood the problem but it is not yet complete because for the difference with the value of 20% students should first look for 20% of 225,000 inhabitants. Whereas in Figure 2 the

post-test answer sheet of high-ability students shows that students have been able to understand the problem correctly. At the time of the pre-test, the ability students were able to understand the problem but not yet overall but at the time of the post-test the ability students were already able to understand the problem as a whole. The following answer sheet pre-test and post-test students' ability is being seen in Figure 3 and Figure 4

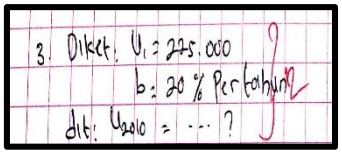

Figure 3 Pre-test Answer Sheet moderate ability students

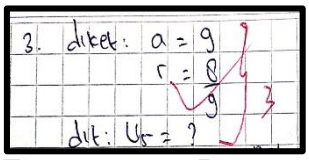

Figure 4 Post-test Answer Sheet moderate ability students

Based on Figure 3 the pre-test answer sheet of students of medium ability, it appears that students have understood the problem but have not yet understood the whole because in the questioned section students should write U_5 because what is meant by the problem, 2010 is the fifth year. Whereas in Figure 4 it can be seen that, students with moderate abilities are able to understand the overall problem. The low ability students during the pre-test and post-test have not been able to understand the problem correctly. Can be seen in Figure 5 and Figure 6

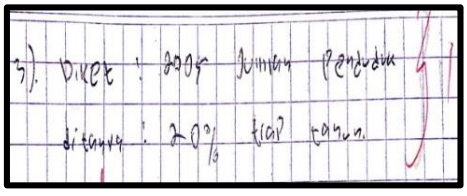

Figure 5 Pre-test Answer Sheet low ability student

Figure 6 Post-test Answer Sheet low ability students

Based on Figure 5, it can be seen that students with low ability have not been able to understand the problem, because the unknown part written by students has not yet clearly seen the purpose of the problem. Furthermore, in the part that is asked students should write U_5 but students write the difference in the question section. Unlike the case at the time of the post-test seen in Figure 6, students who are low in ability to be able to understand the problem by writing are known correctly, but students do not write what is asked from the problem. In the picture presented based on high, medium and low abilities, it can be seen that there has been an increase in problem solving abilities by applying the Problem Based Learning (PBL) model.

CONCLUSION

Based on the analysis of the data and research results obtained, it can be concluded that there is an effect of the application of the Model Problem Based Learning (PBL) to the mathematical problem solving ability of students of class XI MIPA SMAN 1 Sungai Limau as evidenced by the average student pre-test is 48.10 and the average post-test of students is 70.73.

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