

The Effect of Problem Based Learning Models on Learning Outcomes and Problem Solving Skills of Students

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Abstract- This study aims to analyze the effect of problem based learning models on changes in learning outcomes and students' problem solving skills. This research uses a quantitative approach with *Nonequivalent control group design*. The sample in this study were students of seventh class of Junior high school. The experimental group was taught using a problem based learning model (PBL) and the control class used a cooperative learning type *group investigation*. The data obtained were tested using an *Independent sample t-test* to see differences in the two classes of research. The final assessment showed that the results *post-test* students' showed *Sig. (2-tailed)* $0.019 < 0.05$, which means that there are significant differences. The results of observations for the value of problem solving skills at the end of learning shows *Sig. (2-tailed)* $0.000 < 0.05$, which means there is a significant difference. Significant differences indicate that there is an influence of problem-based learning models on learning outcomes and students' problem solving skills.

Keywords: *Problem Based Learning, Learning Outcomes, Problem Solving Skills.*

I. INTRODUCTION

Skills in solving problems are very necessary for students in social learning. This is in accordance with the objectives of social studies learning in the 2013 curriculum which prioritizes students to have the ability to understand concepts related to community life and the environment. Through problem solving skills, learners learn how to focus their minds on the subject, produce alternative solutions, understand the cause and effect relationships, and predict outcomes (Dusek & Ayhan, 2014). The development of 21st century learning skills is learning to improve knowledge expertise, problem solving and essential skills to achieve efficient learning in today's globalization (Sinprakob & songkram, 2015).

Problem solving is a high level mental process and requires a more complex thought process. This is consistent with Gagne's opinion (Bell, 1978) that problem solving skills are the stages of thought that are at the highest level among eight types of learning. The eight types of learning are learning signals, learning stimulus responses, learning sequences, learning verbal associations, learning discrimination, learning concepts, learning rules, and learning to solve problems.

Problem-based learning will also improve the skills possessed by students (Hassan et al., 2012) especially skills in problem solving (Bigelow, 2004). Through problem-based learning students are expected to know various environmental problems that are around them in detail so that they are stimulated to solve and find solutions to existing problems.

The problem solving process is done by using knowledge and skills to achieve a goal. In this process, students are expected to make plans using knowledge and skills about the problem, and use the plan to find the most appropriate solution (Ulusoy et al, 2012).

Dewey said that the cognitive element of student involvement regarding the origin of thought is confusion and doubt triggered by specific things (Yew & Goh, 2018). Starting from the confusion and doubt students are able to activate prior knowledge both individually and collectively to understand a phenomenon. Whereas Thomas (2009) believes that problem-based learning is the main pedagogical device in efforts towards transformative education (Wyness & Dalton, 2018).

Problem-based learning is able to encourage students to learn through participation, practice problem solving skills individually, and exchange ideas with other group members (Phungsuk, Viriyavejakul & Ratanaolarn, 2017). There are four stages of problem-based learning activities which include i) the application of knowledge, teamwork and communication skills, ii) professionalism skills iii) leadership skills and iv) critical thinking and problem solving skills (Mat et al, 2012). Problem-based teaching methods are expected to be able to increase student knowledge acquisition, transfer of learning, and mental effort during learning, as well as improve their learning efficiency (Jalani & Sern, 2015).

Some research on problem based learning models has been done. There is an influence of the use of problem-based learning models on the ability to solve problems (Suwandi et al, 2016), social skills (Andayani et al, 2018), and student interests (Imami, 2018). While the use of PBL models with the assisted discussion method (Yusuf, 2017), and discussions *syndicate group* (Sunardi, 2015) are equally influential on students' critical thinking skills. However, none of the previous studies have specifically identified the effect of problem-based learning models on student learning outcomes and problem solving skills.

II. RESEARCH METHODS

This research is classified into experimental research with the *Nonequivalent control group design*. The groups used in the design of this study were two groups, namely the experimental group that was treated with a problem based learning model and the control group that used the cooperative type *group investigation*. Both groups were given a pretest and posttest to find out the improvement in student learning outcomes using the same test instrument. Whereas with regard to the problem solving skills of students use observation (observation) when learning activities take place. More details can be seen in the following table.

Table 1
 Research Design

Group	Pretest	Treatment	Posttest
RExperiment	O1	X1	O2
RControl	O3	X2	O4

Description:

O1: Pretest experiment class

O3: Pretest control class

X1: PBL

X2: Group Investigation (GI)

O2: Posttest experimental class

O4: Posttest control class

The population in this study were grade VII students of MTs Darussalam Ngoro Jombang in the 2018/2019 school year. The sampling technique is done by *simple random sampling*, namely the determination of the sample by means of a draw without regard to strata in the population. The sample chosen after the simple drawing in this study was class VII A as the experimental class and class VII B as the control class.

The data collection technique in this research is by testing. In this study the test is given on the material potential and utilization of natural resources through *pre-test* and *post-test*. Tests are given to students at the beginning (*pretest*) and at the end (*posttest*). Testing the hypothesis in this study using *independent samples t-test*.

III. RESULT AND DISCUSSION

3.1 Effect of Problem Based Learning Models on Learning Outcomes

a. Pre-test Results

Pre-test or initial test is a test given to the experimental class and the control class before being treated. This test aims to determine the students' early learning achievement of social studies subjects on the material potential and utilization of natural resources. Pretest results show that in the experimental class as many as 9 students (30%) with good categories and 21 students (70%) with enough categories. In the control class it can be seen that a number of 5 students (16.7%) with good categories, 23 students (76.7%) with enough categories, and 2 students (6.7%) with less categories. As for the results of the independent sample t-test the initial knowledge (pre-test) of students using the SPSS 22 program as follows.

Table 2
 Test Results *Independent Sample t-test* Initial Knowledge (*Pre-test*)
 t-test for Equality of Means

Mean		T	Df	Sig. (2-tailed)	Mean Difference
Experiment	Control				
57.20	52.60	1.810	58	0.076	4.60

Based on SPSS output 22 on the table in mind that the value t value 1,810 and t table with a significance level (5%) 0.05, degree of freedom (db) = (n-2), we get t (0.05) (58) table = 2.002. Then the results of the t value > t table, which shows the results of 1,810 < 2.002. As for the significance level of 5% (0.05) has a significance value $\alpha > 0.05$, i.e. (2-tailed) 0.076 > 0.05. So it can be concluded that there is no significant difference in the results of the pretest between the experimental class and the control class before being given treatment, meaning that between the experimental class and the control class students have almost the same initial knowledge at the time of the pretest. This is reinforced by the experimental class obtaining an average value of 57.20 and the control class having an average value of 52.60.

b. Post-Test Results

The final test or post-test is given to students after getting treatment both in the experimental class and the control class. Through this post-test it can be seen differences in students after receiving treatment. Post-test results show that in the experimental class as many as 9 students (30%) with very good categories, 16 students (53%) with good categories, and 5 students (17%) with enough categories. In the control class it can be seen that a number of 3 students (10%) with

very good categories, 16 students (53%) with good categories, and 11 students (37%) with the Fair category. As for the results of the independent sample t-test the final knowledge (post-test) of students using the SPSS 22 program as follows.

Table 3
 Test Results *Independent Sample t-test* Final Knowledge (*Post-test*)

t-test for Equality of Means					
Mean		T	Df	Sig. (2-tailed)	Mean Difference
Eksperimen	Kontrol				
73.33	66.90	2,406	58	0,019	6.43

Based on SPSS output 22 on the table known that tcount of 2.406 and t table with a significance level (5%) 0.05, degree of freedom (db) = (n-2) then we get t (0.05) (58) table = 2.002. Then the results of the t value > t table, which shows the results 2.406 > 2.002. As for the significance level of 5% (0.05) has a significance value $\alpha < 0.05$, i.e. sig (2-tailed) 0.019 < 0.05. So it can be concluded that there is a significant difference in learning outcomes between the experimental class and the control class after being given treatment, meaning that the experimental class learning outcomes after being treated with a problem based learning model are better than the control class using the group investigation learning model (GI). This is reinforced by the experimental class having an average value of 73.33 and the control class having an average value of 66.90.

3.2 Effect of Problem Based Learning Models on Problem Solving Skills

Data on students' problem solving skills is obtained through observations or observations using observation guidelines as data collection instruments. Observations were made in the two class groups, namely the experimental class and the control class for three meetings. Observations were made 3 times at each meeting. The results of observing problem solving skills can be seen in the following table.

Table 4
 Observation Results of Problem Solving Skills

No	Interval	Categories	Meeting 1		Meeting 2		Meeting 3	
			Experiment Class	Control Class	Experiment Class	Control Class	Experiment Class	Control Class
1	81-100	Very good	9	1	8	2	12	1
2	61-80	Well	21	24	22	24	18	29
3	41-60	Enough	0	5	0	4	0	0
4	21-40	Less	0	0	0	0	0	0
5	1-20	Very less	0	0	0	0	0	0
Total			30	30	30	30	30	30

Before the test the hypothesis, the first Test requirements are carried out. Test requirements analysis on students' problem solving skills on material potential and natural resource utilization include distribution normality test and homogeneity variance test. Testing the normality of the distribution has the aim to find out whether the observed data sample the ability to solve problems in the experimental class and the control class are normally distributed or not.

The results of the independent sample t-test for problem solving skills show that with a significance level of 5% (0.05), it has a significance value $\alpha < 0.05$, i.e. (2-tailed) 0.000 < 0.05. So it can be concluded that there is a significant difference in the ability to solve problems between the experimental class and the control class when given treatment, meaning that the results of the observation of the ability to solve the problem of the experimental class when treated with a problem-based learning model is better than the control class using the group learning model investigation (GI).

IV. CONCLUSION

1. learning outcomes in VII grade MTs Darussalam Ngoro-Jombang based on treatment using the problem-based learning model (experimental class) and the cooperative learning type group investigation model (control class) have increased. The experimental class learning outcomes after being treated with a problem based learning model are better than the control class using the group investigation (GI) learning model.
2. The results of research related to students' problem solving skills in class VII MTs Darussalam Ngoro-Jombang show that the experimental class with PBM models is better than the control class that uses the GI type cooperative model. The observation results of students for 3 meetings using the t test were obtained sig. (2-tailed) of 0,000. As for the significance level of 5% (0.05) has a significance value $\alpha < 0.05$, i.e. (2-tailed) 0.000 < 0.05. So it can be concluded that there is a significant difference in the ability to solve problems between the experimental class and the control class when given treatment.

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