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Problem Solving Ability of The Fourth Grade Students in Problem Based Learning On Two Dimensional Figures

Ade Bagus Primadoni[1]✉, Erni Suharini[2] & Mulyono[2]

[1] Universitas PGRI Semarang, Indonesia
[2] Universitas Negeri Semarang, Indonesia

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Abstract

This study has the purpose of testing the effectiveness of the Problem Based Learning (PBL) model on the problem-solving ability of two-dimensional figures. This study applied experimental research with a pre-test – post-test control design model. The population of this study was all of the fourth-grade students of SDN in Batangpretepurposive sampling. The sample of this study was the fourth-grade students of SDN Karangtengah 01 and the fourth-grade students of SDN Kemiri 06. The instrument of data collection used was an essay test. The analysis technique used for analyzing the data was a statistical test of paired sample t-test. The results of this study indicated that the PBL model has effectively improved the students' problem-solving abilities. This is indicated by (1) The classical completeness of problem solving abilities of students in the experimental class using PBL models which reached up to 75%, (2) The average of problem-solving abilities of students in the experimental class with PBL models was more than the average of problem-solving ability of students in the control class using the expository learning models, sig α = 5%, with sig. (2-tailed) of 0.018 since 0.018 < 0.05. therefore, the result is significant, (3) the results of the increase in problem solving ability of the experimental class students using PBL models was indicated by the result of pre-test with the percentage of learning completeness of 51%. whereas, the rest of 49% students did not complete the achievement, then the result of post-test with the result of learning completeness at 80% and the rest of 20% students did not complete, sig α = 5%, with sig. (2-tailed) obtained a score of 0.000 < 0.05. Therefore, it can be concluded that the PBL model is effective on problem-solving abilities of students in the fourth-grade elementary school at two dimension figures material.

✉ Correspondence address:
Dr. Cipto, Jl. Sidodadi Timur No.24, Karangtempel,
Semarang, Jawa Tengah, 50232
E-mail: adeprimadoni@gmail.com

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INTRODUCTION

Law of Republic Indonesia Number 14 of 2005 concerning Teachers and Lecturers, teachers are professional educators with the main task of educating, teaching, guiding, directing, training, evaluating, and evaluating students in early childhood education in formal education, basic education, and secondary level. Structurally, the position of the teacher has a very central role; it can be said that the teacher is the backbone of education. In the process of teaching and learning in elementary schools, this communication ability is also a very important role in the success of achieving learning goals. Mathematics as one of the lessons that has abstract characteristics also requires communication skills in the learning process to be able to understand and convey mathematical ideas well. Mathematics learning aims to form reasoning abilities in students that are measured through the ability to think critically, logically, systematically in solving problems of mathematics and everyday life.

According to Simanjuntak, Manurung, and Matutina (1993) in applying mathematical teaching methods, educators must be able to utilize the natural experiences of children or students to develop mathematical concepts. Meanwhile, according to Mawaddah, and Anisah (2015) explained that many students find it difficult to solve non-routine mathematical problems, namely problems that contain many concepts and the use of mathematical procedures to solve the given problem is unclear. As explain by Aqib (2013) that the quality of learning in our country is generally still low, one of which is due to the underdeveloped professionalism of teachers. Learning is dominated by learning to memorize words, facts or procedures. As a result, graduates are weak in language, problem-solving skills and lack creativity in facing challenging everyday problems.

The application of Curriculum 2013 has brought changes in the learning process. Permendikbud No. 65 of 2013 concerning the Process Standards for Primary and Secondary Education has hinted at the need for a learning process guided by scientific approaches. The application of the approach in the learning process is a characteristic of Curriculum 2013. Learning with a scientific approach is a learning process designed so that students actively construct legal concepts or principles through the stages of observing, formulating problems, collecting data with various techniques, drawing conclusions and communicating the concepts found. Therefore, innovative and fun learning such as cooperative learning models is necessary to be implemented in the learning.

There are various models or types in cooperative learning which are more specific for teachers to be more flexible in designing classroom learning to create variation in the learning. One of them is the cooperative learning model Type of Problem Based Learning (PBL). Wachrodin (2017) stated that PBL is a teaching approach that uses real-world problems as a context for students to learn about critical thinking and problem-solving skills, and to acquire essential knowledge and concepts from the subject matter. PBL learning model is one of the constructivist-based learning methods of real problems in real life students and can be implemented cooperatively (Fadliana, Redjeki, and Nurhayati, 2013). PBL is a learning that is designed to help students solve problems effectively, thus making students intrinsically motivated which will form the basis of knowledge for students (Padmavathy, and Mareesh, 2013).

According to Siswono in (Nugroho, Chotim, and Dwijanto, 2013), he stated that PBL is an approach to learning that begins by posing problems and proceeding to solve the problem. Hmelo-Silver (2004) stated that Problem Based Learning (PBL) is a learning model where students learn through a problem to solve a problem. In line with that idea, Fatchurrohmah, Sarwi, and Utsman (2017) states that the PBL model is learning that always starts and focuses on problems.

Apriyani (2017) stated that Problem Based Learning model (PBL) is a learning model based on existing problems, which places students as subjects of learning so that learning is more student-centered learning. This is in line with

Liyandari (2013) who stated that the PBL model could improve mathematics learning, curiosity, independence, cooperation, students' social skills both with friends and teachers. The main objectives of PBL are to improve the application of knowledge, problem-solving, and student self-learning skills that require them to actively articulate, understand, and solve problems (Susilo, 2012).

Ismawati, Mulyono, and Hindarto (2017) revealed that students 'mathematical problem-solving abilities in PBL with strategies are better than students' mathematical problem-solving abilities in conventional learning. Suherman, Turmudi, Suryadi, Herman, Suhendra, Prabawanto, Nurjanah, and Rohayati (2001) explained that students in the PBL group do not solve problems individually and do not solve only one of them. Through the assistance provided by the teacher and his group friends, it is expected that students can find the correct concept of the problem given. Lintang, Masrukan, and Wardani (2017) states that the implementation of PBL learning is effective for improving students' problem-solving abilities.

METHODS

This study applied experimental research. The population in this study were all of grade IV SDN in Subah, and the sample taken for this study were the students of grade IV SDN Karangtengah 01 and the students of grade IV SDN Kemiri 06, Subah, Batang in the academic year of 2017/2018. Students of SDN Karangtengah 01 were as the experimental group, whereas, the students of SDN Kemiri 06 as the control group. The technique of data collection used in this study tested type. The instruments used in collecting the data were pre-test and post-test in the form of an essay test.

The design used was true-experimental design, white pre-test, and post-test control, as presented in Table 1.

Table 1. The Design of the Study

Class	Pre-test	Treatment	Post-test
Experiment	O_1	X_1	O_3
Control	O_2	X_2	O_4

Information:
X_1 = The learning by using PBL model
X_2 = The learning by using the expository model

RESULTS AND DISCUSSION

Normality of Pre-test Data

The result of the normality test is presented in Table 2.

Table 2. Normality Test

Prerequisite test	Group	Score	Sig	Conclusion
Normality	Experiment Control	0.063 0.689	0.05	Normal

Based on Table 2, the sig value obtained in the Kolmogorov-Smirnov test was 0.063 in the experimental class and 0.689 in the control class. Because the value of sig is greater than 0.05, the data of the two groups were considered in the normal category. Therefore, if the data is normal, the statistical test used is a parametric test using the t-test technique to distinguish the difference between those two classes in their learning achievement.

The Average Similarity of Data Pre-test

The result of the average similarity test is presented in Table 3.

Table 3. The Average Similarity Test

Value	F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed	1.362	.248	1.813	54	.075
			1.870	53.746	.067

Based on Table 3 column sig (2-tailed) obtained a score of 0.075 > 0.05, it can be concluded that the average problem-solving ability of students in both classes is the same.

Classical Completeness Test

The results of the classical class completeness test analysis showed that z_{value} = 0.444. H_0 is rejected if = $z_{value} \geq z$ (0.5- α). The z_{value} of the standard normal distribution list is $z_{(0.45)}$ = 0.1736, therefore, 0.444 > 0.1736, then, H_1 is accepted. It means that the problem-solving

ability in PBL learning reaches 75% of classical completeness.

Comparative Test

The comparative test was done using independent sample t-test with the test of statistical significance α = 5%, in the independent column test sample table sig. (2-tailed) is 0.018 < 0.05, meaning H_1 is accepted. It means that the average problem solving ability of experimental classes using learning Problem Based Learning models is more than the average in the control class learning as in Figure 1.

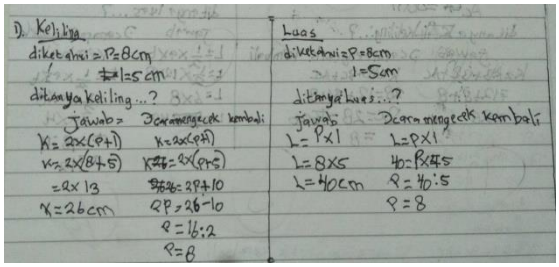

Figure 1. Student's Answer in Experimental Class

Based on the tasks of a student in the experimental class, the student can understand the problem. In the planning, stage student can write the broad formula and circumference of the rectangle, while at the stage of implementing the completion plan student have done the calculation correctly. At the stage of checking the results the student are correct, so all the problems are done thoroughly as presented in Figure 2.

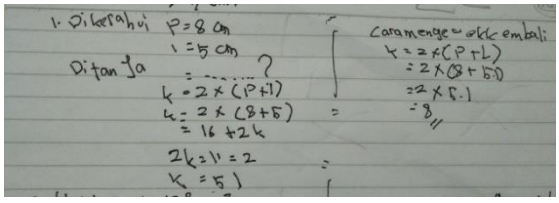

Figure 2. Student's Answer in Control Class

Based on the result of a student's task in control class, the student can understand the problem, and at the stage of preparing the plan, students can only write the formula around the rectangle, while the questions asked are around and the area of the rectangle.

While at the stage of implementing the plan, students make mistakes in calculations and have not been able to work on all the problems in question. Students can only solve problems at the stage of understanding the problem and formulating a plan, while at the stage of implementing the plan and re-checking the results of the student are still wrong in carrying out the calculations.

Improvement Test

The result of the improvement test can be seen in Table 4.

Table 4. Improvement Test

Experiment	N	Average	Max	Min	Completeness (%)
Pre-test	31	58	73	20	51
Post-test	31	70	94	30	80

Test results of pre-test on problem-solving abilities based on Table 5, the percentage of students who complete the learning was 51%, and those who do not complete was 49%, for more detail, it can be seen in Figure 3.

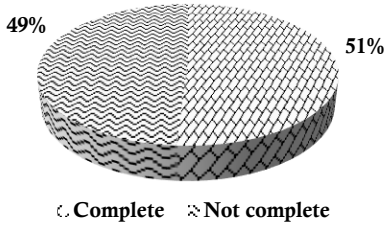

Figure 3. The Completeness of Problem Solving Ability in Pre-test

The post-test results of problem-solving abilities are based on Table 5, the percentage of students who complete the learning was 80%, and those who do not complete was 20%, for more detail, it can be seen in Figure 4.

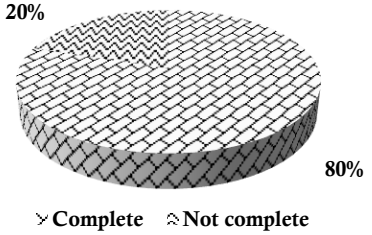

Figure 4. The Completeness of Problem Solving in Post-test

The improvement test results using a paired sample t-test with a significant value of α = 5% in the sig column. (2-tailed) Obtained a score of 0.000 < 0.05, meaning H_1 is accepted. Therefore, it can be concluded that there are differences in students' problem-solving abilities before and after the application of the learning of Problem Based Learning models.

PBL learning in the ability of problem-solving provides positive results on student learning outcomes besides students are more active in solving problems they face.

Saleh (2013) states that PBL is a learning method that teaches students to solve problems and reflect on them with their knowledge, so that skills can be developed (reasoning, communication, and connection) in solving meaningful, relevant and contextual problems.

Setiyadi, Zaenuri, and Mulyono (2018) states that the problem-based learning model is effective in improving students' problem-solving abilities. In fact with Mustaffa, Ismail, Tasir, and Said (2016) showed that PBL had positive results impacting elementary school students in mathematics and could be applied to various domains of knowledge in mathematics.

Fatimah (2012) states that students' problem-solving abilities by applying the PBL model in learning is better than ordinary learning. Gunantara, Suarjana, and Riastini (2014) states that the PBL model can improve problem-solving skills in mathematics subjects. In line with Indarwati, Wahyudi, and Ratu (2014) stated that through the application of PBL can improve the problem-solving skills.

Through the learning of Problem Based Learning model, the problem-solving abilities of students on mathematics subjects of two dimensional figures material was considered effective since the results of the experimental class on the classical completeness test showed $z_{value} = 0.444 > z_{(0.45)} = 0.1736$ therefore, H_1 is accepted which means that the problem-solving ability in PBL learning reaches 75% of classical completeness.

Whereas, the comparative test between the experimental class and the control class can be obtained from the independent sample test t-test with the statistical significance of α = 5%, obtained in the sig column. (2-tailed) is 0.018 since 0.018 < 0.05, then H_1 is accepted, therefore, it can be concluded that the average of problem-solving ability of the experimental class is better than the control class, since the learning in the experimental class using the PBL model makes students more active in the learning, allowing students to investigate problems independently, and facilitate students' problem-solving abilities (reasoning, communication, connections) contextually.

Whereas from the improvement test from before and after the treatment was given, the previous result was 51%, increasing up to 80%.

CONCLUSION

Based on the results and discussion, it can be concluded that learning using the Problem Based Learning model is effective in increasing the problem-solving skills on two-dimensional figures material. This is shown through: problem-solving ability in PBL learning reaches the classical completeness of 75%, besides that, the average of problem-solving ability of the experimental class is better than the control class, there are differences in the problem-solving abilities of students before and after the application of the Problem Based Learning model.

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