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Application Of Problem-Based Learning Models In Flat Shape Learning

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Abstrak

Tujuan penelitian ini adalah untuk membandingkan hasil belajar siswa pada materi Bentuk Datar yang dibelajarkan dengan model *Problem Based Learning* dengan hasil belajar siswa yang dibelajarkan dengan gaya belajar *Direct Instruction*. Desain penelitian adalah eksperimen semu. Penelitian ini melibatkan 20 siswa kelas VIIA yang diajar menggunakan model PBL dan 20 siswa kelas VIID yang diajar menggunakan metodologi DI. Desain penelitian kelompok kontrol pretest-posttest digunakan dalam penelitian ini. Temuan pretest-posttest diperoleh dalam penelitian ini, kemudian dilakukan uji normalitas dan homogenitas sebelum menilai hipotesis. Hasil uji normalitas diperoleh L_{hitung} = 0,1119 L_{tabel} = 0,1920 menunjukkan bahwa data skor pretest-postest kelas eksperimen berdistribusi normal, sedangkan hasil uji normalitas diperoleh L_{hitung} = 0,1862 L_{tabel} = 0,1920 menunjukkan bahwa data pretes-postes untuk kelas kontrol berdistribusi normal. Uji homogenitas menghasilkan F_{hitung} = 1,315523 F_{tabel} = 2,168252, yang berarti kondisi H_0. Akibatnya, variansi kedua kelas eksperimen dan kontrol adalah homogen. Uji hipotesis menghasilkan hasil sebagai berikut: t_{hitung} = 6,851198 > t_{tabel} = 1,685954. Hasilnya, rata-rata1hasil belajar1siswa yang1diajar dengan1model PBL lebih1tinggi daripada1siswa yang1diajar dengan1paradigma DI.

Kata kunci: Hasil Belajar, Model PBL, Bangun Datar, Matematika

Abstract

The purpose1of this study1was to compare student learning outcomes in the material Flat Shapes taught using the Problem-Based Learning model to those of students taught using the Direct Instruction learning style. The research design is quasi-experimental. The study included 20 students from class VIIA who were taught using the PBL model and 20 students from class VIID who were taught using the DI methodology. A pretest-posttest control group research design was used in this study. The pretest-posttest findings were acquired in this study, and then the normality and homogeneity tests were performed before assessing the hypothesis. The normality test results obtained by L_{count} = 0.1119 L_{table} = 0.1920 indicate that the pretest-posttest score data for the experimental class is normally distributed, whereas the normality test results obtained by L_{count} = 0.1862 L_{table} = 0.1920 indicate that the pretest-posttest data for the control class is normally distributed. The homogeneity test yielded F_{count} = 1.315523 F_{table} = 2.168252, implying that the condition H_0. As a result, the variances of the two classes, experimental and control, are homogeneous. The hypothesis test yielded the following results: t_{count} = 6.851198 > t_{table} = 1.685954. As a result, the average learning results of students taught using1the PBL model are1higher than those1of students taught1using the DI paradigm.

Keywords: Learning Outcomes, PBL Models, Flat Shapes, Mathematics

INTRODUCTION

Mathematics is the science of quantity, structure, space and change. Mathematics discovers patterns, formulates new conjectures, and constructs truths through a rigorous deduction method derived from axioms and coincidental definitions (Musyassar & Harahap, 2020; Nurangaji et al., 2021; Putri, 2022). Mathematics is also called the science that explains important conclusions (Rachmantika & Wardono, 2019; Hasanah et al., 2022). The importance of learning mathematics is inseparable from its role in various aspects of life (Fadillah, 2015; Anwar, 2018; Sadewo et al., 2022). In addition, by studying mathematics, a person is used to thinking systematically and scientifically, using logic, being critical, and can increase his creativity (Zanthy, 2016; Nurhayati, 2018; Marni & Pasaribu, 2021). Learning mathematics is a process of interaction between teachers and students that involves developing thinking patterns and processing logic in a learning environment that is deliberately created by teachers with various methods and learning models so that mathematics learning programs grow and produce optimally (Umbaryati, 2016; Harahap & Fuuzi, 2017; Yulianto et al., 2020).

Learning models can help develop students' imagination power, help develop students' reasoning, acquire skills, values, ways of thinking, and ways of expressing themselves, teach how they learn and assist the students in being actively involved in the classroom. Teachers are expected to be able to choose learning models that can stimulate students' interest in learning (Kusumawati, 2019; Magdalena et al., 2021). The selection of learning models is essential in the learning process. With effective and efficient learning models, students' participation and activeness in learning will improve student learning outcomes (Juniati & Widiana, 2017; Wahyuni, 2020). Thus, learning Flat Shape material can achieve Minimum Learning Mastery (KBM).

Many schools, especially teachers, have made efforts to improve student learning outcomes, but they could be more optimal. Low students' understanding of mathematical concepts will impact students' inadequate knowledge of solving a problem, resulting in expected student learning outcomes. This happened at MTs Negeri 1 Bitung based on initial observations made by researchers. The learning outcomes of students' flat shape materials at these schools are still relatively low. So the level of understanding of the material still needs to be improved. This is proven according to the percentage of classical teaching and learning, namely that around 35% of students have completed it while 65% have not.

The results of interviews with Mathematics teachers who teach flat shape material obtained information that: (1) The learning model used by the teacher is not creative and innovative, so students get bored quickly. The desire to learn still needs to be improved because most students only hear what the teacher conveys, resulting in a level of understanding of the material still not enough. (2) The learning model that is still mainly used is the direct learning model (Direct Instruction), where students depend on the teacher, and have not been able to solve their problems, are less willing to think, students only receive material and do not understand the concept of learning mathematics itself. (3) The use of learning models that are not appropriate, not creative and innovative in learning mathematics can hinder the achievement of learning outcomes in mathematics. Other factors that cause low student mathematics learning outcomes are: (1) Learning is still centred on the teacher rather than students. Teachers are still less creative in delivering material (2) Teachers do not master and apply skills in class, pay less attention to student activity, and many students are passive in learning mathematics because it is considered difficult and uninteresting. This can impact student learning outcomes that could be more optimal in Mathematics.

The mathematics learning process can run effectively and efficiently if students and teachers are actively involved and work together during learning. Learning objectives can be achieved if all the factors influencing learning outcomes run well. Factors influencing these include teachers, curriculum, environment, models, methods, facilities and infrastructure. When starting to learn mathematics, the teacher should first convey the learning objectives to be achieved, as well as the learning model used. After that, the teacher says what the problem is like and what problems often occur in everyday life related to mathematics. Then the teacher guides students to master mathematical concepts and invites students to play an active role in learning mathematics to recognize and solve problems. The teacher must be able to challenge students in thinking to solve problems and provide real issues around students so that students are not deep in thinking and that students' insights can be opened. The teacher is said to be successful if the learning model's objectives can be achieved on time and on target.

A teacher needs to use creative and innovative learning models so that students become active and motivated in learning, and student learning outcomes can also increase. One learning model that is thought to improve student learning outcomes is the Problem-Based Learning model, whose goal is for students to solve a problem in learning to achieve learning objectives. Applying the PBL model in learning mathematics can improve student learning outcomes. Several previous studies on using the PBL model in learning Mathematics showed increased student learning outcomes.

Some problems in the real world, namely mathematics, flat wake materials such as rectangles and triangles, are material that is very close to real life. Many events we encounter daily use rectangles and triangles as examples of rectangular shapes, namely batik motifs, house ventilation, fence motifs and toy kites. In contrast, for flat triangles, examples are arrowheads, pizza slices, roofs of houses, and triangular ruler is the application of flat shapes in everyday life. Thus, it is assumed that the PBL model can be used in learning flat shapes material.

METHOD

This type of research is comparative research with a quasi-experimental method (quasi-experimental) which aims to compare students' mathematics learning outcomes in two classes. The first class is called the Experiment Class, with the treatment being the Problem-Based Learning model, while the second class is called the Control Class, with the treatment being the Direct Instruction model.

The research design used in this study was the Pretest-Postest Control Group Design. Samples were randomly selected and divided into two sample groups: experimental and control groups. Thus, the research design is described in the following table:

Table 1 Two Group Research Design (pre-test and post-test)

Class	Pre-test	Perlakuan	Post-test
Experiment	B1	X1	B2
Control	B1	X2	B2

Information :
BI : Provision of initial test (pre-test)
B2 : Administration of the final test (post-test)
X1 : Treatment given with PBL Model
X2 : Treatment given with DI Model

This research was conducted at MTs Negeri 1 Bitung, in Bitung City, North Sulawesi Province, in the odd semester of the 2022/2023 school year. The population in this study were all students of class VII MTs Negeri 1 Bitung consisting of 10 courses, each class consisting of 20 students. The sample in this study used a random sampling technique (simple random sampling) because each member of the population has the same ability to be selected.

The variables in this study were the mathematics learning outcomes of students who were taught using the Problem-Based Learning model and those who were trained using the Direct instruction model.

This research instrument was a set of test questions in the form of a description test totalling five numbers. Before being distributed to the research sample, the questions were tested on students in other classes or outside the sample class. The test questions are intended to test the validity and reliability of the test questions.

Research data was collected by giving tests to research samples. The test is in the form of questions in the form of a description test that has been tested for validity and reliability. Data collected by administering tests to subjects were processed with the help of Microsoft Excel to describe the required statistical measures (sum of datum, minimum datum, maximum datum, average, standard deviation/standard deviation, variance/variety). Because the research design uses the Pretest-Posttest Control Group Design, the data that is processed is data (the difference between the posttest and pretest = posttest – pretest).

RESULT AND DISCUSSION

Research Results

The research data were taken from two randomly selected classes, namely, class VII. A and class VII.D with 20 students in class VII.A (experimental class), and 20 students in class VII.D (control class). In this study, the data taken were student learning outcomes in flat shape materials obtained through tests after learning. The data analysis from the pretest-posttest of the experimental and control classes can be seen in the following table.

Table 2 Summary of data from the pretest-posttest results of the experimental class

No.	Statistics	Value
1.	Amount	225
2.	Minimum Score	5
3.	Maximum Score	15
4.	Average	10,714300
5.	Variance	10,302629
6.	Standar Deviation	3,209771

Table 3 Summary of data from the pretest-posttest results for the Control class

No.	Statistics	Value
1.	Amount	88
2.	Minimum Score	1
3.	Maximum Score	12
4.	Average	4,190500
5.	Variance	7,831579
6.	Standar Deviation	2,798496

Before testing the hypothesis using the t-test, the normality test and homogeneity of variance were tested in the pretest-posttest data from the control and experimental classes. Normality, uniformity, and data hypothesis tests are presented as follows.

Data normality test

Hypothesis:
- H0: data normally distributed
- H1: the data is not normally distributed

Decision criteria:
- If the value of L_{count} < Ltable accept H0, then the data distribution is declared normal
- If the value of L_{count} > Ltable reject H0, then the data distribution is declared not normal

Table 4 Data on Normality Test Results for Pretest-Posttest Scores for Experimental Class and Control Class

Class	N	L_{count}	L_{table} ()	Ket
Control	20	0,1862	0,1920	Normal
Experiment	20	0,1119	0,1920	Normal
Conclusion: Normal distribution				

Based on the table above, the data from the normality test results for the pretest and posttest values in the experimental and control classes come from usually distributed populations.

Homogeneity Test

The data used for the homogeneity test are pretest and posttest scores. Following are the steps for testing the homogeneity of the control and experimental classes.

1. The statistical hypothesis to be tested in both groups is:
   H0 : (both variances are the same)
   H1 : (the two variances are not the same)
2. Real level :
3. Test Statistics:
   , when
4. Test Criteria:
   If the value of F_{count} > Ftable, then reject H0
   If the value of F_{count} <Ftable, then accept H0

Table 5 Data on Homogeneity Test Results for Pretest-Posttest Scores for Experiment Class and Control Class

	0,05
F_{count}	
F_{table}	
$F_{count} < F_{table}$	Homogeneous

Based on the data above, the variances of the two classes, namely the control and experimental classes, are homogeneous. (Full calculation results can be seen in attachments 8 and 9).

Hypothesis testing

Because the normality and homogeneity tests have been fulfilled, hypothesis testing using the t-test can be carried out. Testing the hypothesis is as follows.

H0 : average student learning outcomes taught using the Problem-Based Learning model.
H1 : average student learning outcomes taught without using the Problem-Based Learning model

Based on the hypothesis testing criteria, reject H0 if the test statistic falls within the critical area. From the results of testing the hypothesis with the t-test at the fundamental level () = 0.05, tcount = 6.851198 and ttable = 1.685954. So, tcount = 6.851198 > ttable = 1.685954, meaning the test statistic falls within the critical area. This shows that there is enough evidence to reject H0. (Complete calculations can be seen in Appendix 10).

Therefore, it can be concluded that reject H0. From testing the hypothesis, the average learning outcomes of students who are taught using the PBL model are higher than the intermediate learning outcomes of students who are prepared without using the PBL model on flat shape material.

Discussion of Research Results

The average difference in student learning outcomes occurs because of differences in the learning process between the two classes. The experimental class was assisted by the PBL model, which was able to attract students' interest in learning flat shapes with a scientific approach so that in the learning process, students became more active and more motivated and enthusiastic in learning, as expressed by Harmenita et al. (2021) who stated that the Problem-Based Learning model is a model for developing students' active learning methods by finding themselves, and investigating themselves so that the results obtained are more meaningful, durable and not easily forgotten by students.

This is also supported by the many real problems in the environment around students related to flat material so that students can respond and easily understand the learning of flat shapes by applying the PBL model. In contrast to the DI learning model, which focuses more on teaching the teacher, the teacher is more active in explaining the material, which impacts the lack of student activity in learning in class, which causes students to become passive in the learning process. As a result, students become disinterested in learning mathematics in class and then have an impact on decreasing learning outcomes. This causes these two learning models to differ from the average learning outcomes, where the PBL model gets an average learning outcome higher than the Direct Instruction learning model.

CONCLUSION

Based on the results of research conducted at MTs Negeri 1 Bitung, it was found that the average learning outcomes of students who were taught using the PBL model were higher than the intermediate learning outcomes of students who were prepared with the Direct Instruction learning model. Thus, learning by applying the PBL model can increase the average student learning outcomes in flat shape material. For this reason, based on the results of this study, it is hoped that students can play an active role in every learning process in class and constantly develop the learning experiences they have through the application of the PBL model in all mathematics learning so that they can improve their learning outcomes..

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