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THE IMPACT OF THE PROBLEM-BASED LEARNING MODEL ON IMPROVING MATHEMATICAL UNDERSTANDING AND CREATIVITY STUDENTS

Ruth Mayasari Simanjuntak
Department of Mathematic Education, HKBP Nommensen of University
ruthsimanjuntak@uhn.ac.id
Siti Sadar Sulastri Lumban Batu
HKBP Nommensen of University
sitisadar.lumbanbatu@student.uhn.ac.id

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Abstract:
The purpose of this study is to ascertain if the problem-based learning teaching methodology can improve students' mathematics understanding and creativity when teaching class VII junior high school quadrangular material. This sort of study is a quasi-experimental study with all grade VII at state junior high scholl in Pegagan Hilir T.A 2022/2023 as the research population. Through the use of straightforward random sampling techniques, experimental class research samples for classes VII-4 and VII-3 controls were acquired. Techniques for gathering data include documentation, experiments, and observations. Data analysis with the observation evaluation sheet and independent sample t-test. According to this study, using the Problem Based Learning instructional style can help kids become more creative and better at understanding mathematics. T-test analysis can be used to get this result.

Keywords: Key words: efficiency, creativity, mathematical understanding ability, and problem-based learning

INTRODUCTION

According to Hidayat and Abdillah (2019: 24), education is a deliberate and planned effort to offer direction in developing the physical and spiritual potential that adults give to students to mature and attain the objective of students being able to carry out their life's tasks independently. One of the subjects that is taught at all educational levels and that plays a significant part in education is mathematics. Thus, in order to produce great education, the learning process must be able to foster aptitude and mold human character. One of the academic disciplines that plays a significant part in education and is taught at all educational levels is mathematics.

According to Mullis et al. in the TIMSS (Trend International Mathematics and Science) study, which places Indonesia 49th out of 53 participants, the quality of mathematics in Indonesia has not improved. Aspects that must be kept in mind by the government, educational institutions, and parents in order to raise the level of mathematics proficiency among Indonesian students by recognizing the challenges associated with the subject (Sholeh & Fahrurozi, 2021). The challenge is brought on by the fact that teachers are the only ones who provide information to students, and that they also adopt a traditional teaching method that impairs their capacity for comprehension and creativity.

In addition, gaining mathematical understanding at the time of learning can only be accomplished through learning with understanding (Syarifah, 2017; Agustini &; Pujiastuti, 2020). Therefore, the ability to understand mathematics is a strength that should be taken into account and treated functionally in the process and objectives of learning mathematics. Students may find it challenging to solve problems if they have poor mathematics comprehension skills. Students are unable to identify the solutions to problems because of this. One of the learning processes and results is the capacity to comprehend mathematics (Davita et al., 2020).

According to Nurani et al. (2020: 3), creativity is the capacity to create something new out of a mixture of data or information that has already been acquired. Low levels of student creativity can contribute to the subpar TIMSS outcomes. Teachers primarily give up on innovation due to time constraints and material overload. Students provide succinct responses devoid of explanation and complexity. The outcomes of students' work are only encouraged by

examples of problems and formulae in the book without being able to provide alternative solutions in different methods, thus students find it challenging to find solutions when there are additional difficulties presented.

Researchers use the Problem Based Learning technique to provide solutions from this problem. Real-world challenges provide as a backdrop for students to develop their critical thinking and problem-solving abilities as well as their knowledge in the problem-based learning approach (Primadoniati, 2020). According to Amir in Sholeh & Fahrurozi (2021), the benefits of the problem-based learning model include the ability to improve students' problem-solving skills, make it simpler for students to remember what they have learned, improve students' comprehension of the material, increase students' abilities that are relevant to the world of practice, and foster cooperation and leadership. Students' mathematics understanding abilities and creativity are anticipated to increase as a result of using the problem-based learning model.

METHODS

This study used quantitative research as its method. By analyzing the relationship between variables, quantitative research is a method for testing certain theories (Rukminingsih et al., 2020:16). They are quasi-experimental in nature. Utilizing a pretest-posttest control group design, with one group utilizing the PBL paradigm and a control class using traditional techniques. This design can be described as follows:

Table 1 Research Design Scheme:

Class	Pre-test	Treatment	Post-test
Experiment	O_1	X	O_2
Control	O_1		O_2

Information:
O_1 : *Pretest* in experimental class and control class.
O_2 : *Post-est* in experimental class and control class.
X : *Problem Based Learning* (PBL) model.

The independent variable in this study is the PBL model (X), while the dependent variables are creativity (Y1) and mathematics understanding ability (Y1). State Junior High School in Pegagan Hilir, Bandar Huta Usang, Pegagan Hilir District served as the site of the research. Where is the class VII population located z The tests that are run include validity tests, reliability tests, question item difficulty tests, and tests of distinguishing power. Data on student learning outcomes must be collected using two tests, a pretest and a posttest. Data on the implementation of learning and the amount of time used are collected using observation sheets for the implementation of learning models and observation sheets for time allocation, respectively. While learning outcome assessments, time allocation observation sheets, and implementation observation sheets were the research tools used in this study. The trials conducted include reliability tests, validity tests, tests of the complexity of the test items, and tests of differentiating power. The method of data collection used in this study requires that student learning outcomes tests be given; these tests are administered as a pretest and a posttest. Data on the implementation of learning and the amount of time used are collected using observation sheets for the implementation of learning models and observation sheets for time allocation. The analysis method employed measures how well the PBL model improves student creativity and mathematical understanding as seen from the effectiveness indicators, namely the suitability of the learning level as seen from the observation sheet, the quality of the learning level starting with the calculation of normality, homogeneity, N-Gain, and hypothesis testing by applying the t-test which is as follows:

Table 2. observational record

Observed aspects	Observers			Average
	Meeting results 1	Meeting results 2	Meeting results 3	
Listen / listen to the teacher's explanation of the learning information to be implemented				
.....				
.....				

with criteria namely
1 ≤ TKG < 2 (Not Good),
2 ≤ TKG <3 (Not Good),

3 ≤ TKG <4 (Good Enough), 4 ≤ TKG <5 (Good),
TKG = 5 (Very Good),
Description*:* TKG = Teacher Ability Level.
And the time is seen from the observation sheet with the following assessment criteria:
1 = Longer achievement time is above 51% of the time in Lesson Plan .
2 = Longer achievement time of about 5%-50% of Lesson Plan
3 = Faster achievement time 2% of RPP time to 4% longer than Lesson Plan time
4 = Faster achievement time by about 5% to 25% of Lesson Plan time
5= Fast achievement time reaches above 26% of Lesson PLan time

DISCUSSION

Through efficacy metrics, the PBL model's success in improving students' mathematics understanding and creativity is determined.

1. Learning standards, mathematical understanding, and originality
   The t test results show that there is a substantial difference in learning quality between using PBL models and traditional learning, beginning with the calculation of the normalcy test. An independent sample t test was run using posttest results from the experimental class and the control class to determine whether there was a discernible difference in the level of student creativity between the experimental class and the control class. It was demonstrated using SPSS software version 22.0 that the independent sample t test's Sig. (2-tailed) value was 0.000. This significant value is used to demonstrate that the significant value is less than 0.05, leading to the conclusion that H_0 is rejected and H_a is accepted.

Table 3. Hypothesis Test Results of mathematical comprehension ability

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Nilai	Equal variances assumed	15.542	.000	11.521	68	.000	32.857	2.852	27.166	38.548
	Equal variances not assumed			11.521	43.282	.000	32.857	2.852	27.107	38.607

The results of the t test based on table 2's data results, which have data results of 0.000 < 0.005, are used to draw the conclusion that H_0 is rejected and H_a is accepted. The quality of learning on the ability to understand mathematics shows a significant difference where the homogeneity result data is homogeneous and normality result data is normally distributed.

Table 3. Hypothesis Test Results of mathematical comprehension ability

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Nilai	Equal variances assumed	3.664	.060	7.927	68	.000	24.571	3.100	18.386	30.757
	Equal variances not assumed			7.927	60.165	.000	24.571	3.100	18.372	30.771

The conclusion is formed that H_0 is rejected and H_a is accepted whereas the results of the Hypothesis test for creativity have data findings of 0.000<0.005.

2. Learning Level Suitability
   According to teacher observations, the mathematical understanding ability is rated as good according to the criteria for the learning level's applicability, with a value of 4.2 < 5.3). The results of teacher observations, which have a value of 4.2 < 5. 3, classify the adequacy of the level of creativity learning as good.
3. Time

The observation sheet's findings are as follows:

Table 3. Results of Time Allocation Observation Sheet of Problem Based LearniMng Model

Material/Subject/Sub subject	Normal Time	Time of Achievement	Criterion					Total	Average
			1	2	3	4	5		
Quadrangular understanding	40 Minutes	25 Minutes					✓	19	4,75
Types of quadrangles	60 Minutes	40 Minutes					✓		
Properties of quadrilaterals	70 Minutes	50 Minutes					✓		
Perimeter and area of the rectangle	70 Minutes	60 Minutes				✓			

With a value of 4.75 based on time observations, the observation sheet's findings about mathematics understanding ability and inventiveness are rated as good.

CONCLUSION

Looking at the findings of the research that has been mentioned, we can draw the conclusion that the Problem Based Learning model is successful in enhancing students of SMPN VII SMPN 1 Pegagan Hilir T.A 2022/2023's mathematics comprehension capacity and creativity.

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