

Differences in Mathematics Learning Outcomes in Learning Using Discovery Learning and Problem Based Learning Models

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ABSTRACT

This experimental research aims to test whether there are significant differences in mathematics learning outcomes between classes taught using discovery learning and problem – based models of learning. The type of the research is Quasi - experimental research. Research population was the students of 5A and 5B, each numbering 26 people. The sample measurement was determined by using the Federer formulation, where each group was found to have 16 members. Sampling members were determined randomly. Data was collected through observation sheets and multiple - choice test questions. Data were analyzed using the independent sample t - test statistical technique using the prerequisite tests for normality and homogenies. However, because the normality test result showed that the data was not normally distributed, the data processing used non - parametric statistics Mann Whitney U Test. The result showed that the Asymp Sig value was 0.039 < 0.05, indicating that there is a significant difference in mathematics learning outcomes between the groups taught using the Discovery Learning and Problem - Based Learning models.

Keywords: discovery learning, problem - based learning, mathematics learning outcomes.

1. BACKGROUND

Education is an effort undertaken by a person or group of people to influence that person or group of people to become mature and reach a higher level of living[11]. The aim of education according to Law number 20 of 2003 concerning the national education system is to develop capabilities and form dignified national character and civilization in the context of educating the nation's life, aiming at developing the potential of students to become human beings who believe and fear God Almighty, noble, healthy, knowledgeable, capable, creative, independent, and a good citizen democratic and responsible[2].

Mathematics education in elementary schools is the most fundamental and important thing considering that mathematical concepts are always used in everyday life[12]. Students who have been able to master the material at school are expected to be able to use it when these students are in a community environment[10].

According to [9] mathematics is a science that discusses patterns and regularities. As a science,

mathematics has an important role in forming creative ways of thinking trough patterns and regularities [3]. Students who study mathematics are not only expected to be able to develop reasoning but also thinking logically to solve problems related to daily life [1]. This is in accordance with one of the goals of mathematics education, which is to develop student participation in social life. One of the goals of mathematics education in elementary schools is to develop an active, creative, logical mindset, which can be a provision for future life[8].

Various learning models can be applied in mathematics learning to improve critical and creative thinking[5]. Students can build new knowledge based on discoveries or investigations obtained through implementation the discovery learning model. Apart from that, to raise students' curiosity in solving a problem, they can use the problem based learning model. According to Hosnan [14]discovery learning is learning to discover.

Meanwhile, according to Barrow as quoted by [15] defines problem-based learning as learning that is

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obtained through a process that leads to an understanding of the resolution of a problem.

According to [4], in the Discovery Learning model, the pupils are brought into a problem to find answers to structured questions. The learning model when viewed from the steps is indeed not the same, but the two models have something in common, namely the learning process is more focused on students working together in solving problems[8].

Based on learning models of the Discovery Learning and Problem Based Learning [6], researchers want to know the level of effectiveness or significant differences in learning outcomes in the application in 5th grade students at Kasongan Elementary School.

2. RESEARCH METHODS

In the research, researchers used experimental research. The design of experimental research used a quasi-experimental design. Suggests that to find the effect of certain treatments under artificial conditions, experimental research methods can be interpreted as research methods. Furthermore [13]. Explains that quasi-experimental design has two important things, namely having a control group but not being able to fully control external variables that influence the implementation of the experiment.

The research was conducted at SD Kasongan. Bangunjiwo, Kasihan, Bantul, from April to June 2023. The population for this study was all gr 27s 5A and 5B. each of which consisted of 26 people. The measurement sample was determined by using the Federer formula, where each group was found to have 16 members. Sampling members were determined randomly. Data was collected through observation sheets and multiple choice test questions. Data analysis uses parametric statistical analysis by carrying out prerequisites in the form of normality tests and homogeneity. If the normality and homogeneity tests are met, then data analysis is performed using the statistical technique of independent Sample t-test but if one of the conditions was not et then the data was analyzed by using non-parametric analysis techniques.

3. RESULTS AND DISCUSSION

3.1 Result

This research was conducted at Kasongan Elementary School on grade 5 students with material on building space at second semester of the 2022/2023 academy years. Meetings in experimental and control classes with time allocation for each meeting were 2x 35 minutes. As a prerequisite test for parametric statistics. The Kolmogrov Smirnov normality test and homogeneity test were carried out. In the normality test, if Sig. > 0.05 then the data was said to be normally distributed, and if Sig. <0.05 then the data was not normally distributed. The following of normality test result are presented in the following table:

N		Pretes Eksp	Pretes Kont
		16	16
Normal Parametersa,b	Mean	67,1875	66,5625
	Std. Deviation	2,561738	3,010399
Most Extreme Differences	Absolute	0,365923	0,448132
	Positive	0,365923	0,448132
	Negative	-0,30137	-0,30187
Test Statistic		0,365923	0,448132
Asymp. Sig. (2- tailed)		.000c	.000c

Table 1. One-Sample Kolmogorov-Smirnov Test Normality Test Results

Based on table 1, it can be concluded that the not normally distributed. While the homogeneity test results are presented in the following table:

Table 2. Homogenity Test Results

		Di	fferences in	n Mathematics
Based on Mean	0,06647	1	30	0,798308
Based on Median	0,4	1	30	0,53188
Based on Median and with adjusted df	0,4	1	29,2511 7	0,532002
Based on trimmed	0,335561	1	30	0,566727
mean				

Based on table 2, it is concluded that the Sig value is 0.798 0.05, so the data the experimental group and control group were declared homogeneous. Based on the results of the prerequisite tests that have been carried out, it can be seen that the distribution of the data is not normal. Because the data distribution is not normal, one

of the requirements for using parametric statistics is not fulfilled.

As another alternative, data processing was carried out using the non-parametric statistics Mann Whitney U Test. The following non-parametric tested results are presented in table 3:

Table 4. Mann	Whitney	U Test	Non-Parametric	Test Results

Mann-Whitney U	74,5
Wilcoxon W	210,5
Z	-2,061433749
Asymp. Sig. (2-tailed)	0,039261678
Exact Sig. [2*(1-tailed Sig.)]	.043b

From the results of these calculations, the inference results are Sig value is 0.039 <0.05, so that is stated that there is a difference significantly in mathematics learning outputs between groups are taught using the Discovery Learning and Problem Based Learning models. Thus, HO which states that there is no significant difference in mathematics learning outputs between classes taught by using the Discovery Learning and Problem Based Learning models is rejected. On the other hand, Ha, who stated that there were differences significantly in mathematics learning outputs between classes taught by using the Discovery Learning and Problem Based Learning models, was accepted.

3.2 Discussion

This research was conducted to find out diversity in student learning outputs in two groups of students with different treatments. Previously, normality and homogeneity tests are carried out. States that the homogeneity test is used to show two or more groups of sample data originating from populations that have the same variances in a statistical test procedure [7]. Through the normality test, the researchers use the possibility value (sig) parameter as a reference with the condition that if the possibility value (sig) is > 0.05 then the data is ordinary distributed. Meanwhile, in case the possibility value 32 <0.05, the data is not ordinary distributed. The

normality test is used to confirm whether the data obtained is ordinary distributed or not.

Furthermore, [7] explains that states that the homogeneity test is used to show two or more groups of sample data originating from populations that have the same variances in a statistical test procedure. The homogeneity test aims to specify whether the research sample appear from a population that has homogeneous various or not. Through this homogeneity test, researchers use the possibility value parameter (sig) as a reference with the condition if the probability value (sig) is > 0.05 then data has the same variance (homogeneous). Meanwhile, if the probability value (sig) is <015 then the data does not have the same variance (not homogeneous).

The normality test results show an Asymp.Sig value of 000 < 0.05, so distribution of data is declared abnormal. While homogeneity test showed that a Sig value of 0.798 > 0.05, the experimental group and control group data were declared homogeneous Based on the results of normality and homogeneity tests as a prerequisite for parametric statistical analysis, if one of them is not met, the data is then processed using non-parametric analysis techniques.

The non-parametric analysis techniques the Mann Whitney U Test analysis. Ho will be accepted if the posibility value (sig) is > 0.05. While Ho will rejected if

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8 S. Lestari and H. Sujati the possibility value (sig) < 0.05. The results of the nonparametric statistical analysis of the Mann Whitney U Test show that the Asymp Sig value is 0039 < 0.05 or Ho is rejected. Thus, the conclusion is that there are significant differences in mathematics learning outputs between groups taught using the Discovery Learning and Problem Based Learning models. This is in line with that was stated by Mulvasa (2015: 155) that the discovery learning model is a model of learning where students can discover something meaningful in learning. A learning process like this will arouse motivation in students, namely the student's curiosity, whether or not he is able to find something that should be in accordance with the supporting theory. Hosnan (Afria, 2019: 8) contains that discovery learning has the characteristics of (1) creating problems solving, exploring, combining and generalizing knowledge, (2) student-centered learning, (3) actions to combine new knowledge and existing knowledge. Therefore learning outcomes of mathematics in an experimental class taught by the discovery learning model were significantly higher. This is proven by the significant difference in mathematics learning outputs between two groups in the Discovery Learning and Problem Learning models in the results of the Mann Whitney U Test. Therefore, Mathematics learning outputs in an experimental class taught by applying the discovery learning model were significantly higher. This is proven by the significant difference in mathematics learning outputs between two groups in the Discovery Learning and Problem Learning models in the results of the Mann Whitney U Test.

4. CONCLUSIONS AND SUGGESTION

4.1 Conclusions

Based on the data analysis and research results that have been described, it can be concluded that the results of learning mathematics using the discovery learning model are significantly higher than problem based learning. This conclusion is based on the nparametric Mann Whitney U Test which shows an Asymp Sig value of 0.039 < 0.05. Because the Sig < avalue is 0.039 < 0. Ho is rejected and Ha is accepted, which means that the [6] results of learning mathematics using the discovery learning model are significantly higher than those with the problem based learning. 28

4.2 Suggestions

Based on the results of the research that has been carried out, there are several suggestions, namely: 1) teachers are expected to be able to implement discovery learning models that are more effectively used in learning to improve student learning outcomes in mathematics learning by adapting the material to be taught, 2) school principals can socialize and organize training regarding the discovery learning model for lass teachers or other school principals. In this way, this discovery learning model can be used by teachers to develop creative. innovative and fun learning processes, and 3) it is hoped that in the future the research carried out will be better.

AUTHORS' CONTRIBUTIONS

Sri Lestari as a master of education student and lecturer Dr. Hereditus Sujati, M.Pd. both came up with the idea for the research. Sri Lestari analyzed the problems that occurred at school and made a background. Dr. Hereditus Sujati, M.Pd. contributed to the methods used in the research. The two authors analyzed the research conducted. Then they discussed the result and contributed to the final manuscript.

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