APPLICATION OF POLYA MODEL LEARNING TO IMPROVE STUDENTS' CREATIVE THINKING SKILLS

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Abstract

The purpose of this researcher is to determine the application of the polya model to improve students' creative thinking skills. This study used Quasi-Experimental method and nonequivalent pretest-posttest control group design. The population in this study is grade VIII students of SMP Negeri 2 Sepatan semester 2 of the 2022/2023 academic year, totaling 376 students. Sample in this study were grade VIII.2 students totaling 44 students as an experimental class and class VIII.6 totaling 43 students as a control class. The learning model used in the experimental class is the polya model. The data collection technique is using test instruments that have been adjusted based on creative thinking indicators, The results of this study show that there is a significant increase in polya model learning to improve the creative thinking ability of grade VIII students of SMP Negeri 2 Sepatan evidenced by: Independent Sample t-test results on N-Gain data Shows that the GIS value of 0.05 or 0.000 0.05 is rejected and accepted. Thus, it can be concluded that the increase in creative thinking ability of students who get ≤≤ 0 1polya model learning is better than students who get lecture model learning.

Keywords: Polya Model, Creative Thinking Ability

INTRODUCTION

Education is part of a very important and basic human need. Education can develop human knowledge and is very useful for everyday life. One of the abilities that must be possessed by students is the ability to think creatively. As explained in the Regulation of the Minister of Education and Culture Number 103 of 2014 concerning learning article 2 paragraph 1 explains that learning in primary and secondary education is carried out on an activity-based basis with the characteristics of (a) interactive and inspirational, (b) fun, challenging, and motivating students to actively participate, (c) contextual and collaborative, (d) providing sufficient space for initiatives, creativity, and independence of students, and (e) according to students' talents, interests, abilities, and physical and psychological development. From the Regulation of the Minister of Education and Culture Number 103 of 2014 concerning learning article 2 paragraph 1 explains that the ability to think creatively is very important for students to be able to increase student knowledge.

One of the lessons that can improve creative thinking skills is mathematics. According to Handoko (Marliani, 2015) mathematics can be used to develop systematic, logical, creative, disciplined, and effective cooperation skills in modern and competitive life.

Handoko's statement explained that creative thinking is important in the mathematics learning process, especially in improving students' creative thinking skills.

According to Filsaime (2008), "Creative thinking is a thought process that has the characteristics of fluency, flexibility, originality and detailing or elaboration" (p. 9). This means that creative thinking requires students to be able to develop their abilities, and look for new ideas in the mathematics learning process.

Based on observations and the results of the researcher's interview with Mr. Kohar as a grade VIII teacher at SMP Negeri 2 Sepatan, Tangerang Regency, on October 24, 2022. Stating that students' creative thinking ability is still relatively low, because from the percentage of class VIII teachers only 30% of students are able to understand the material and solve the question answers well and 70% of students most of them lack mastery of basic mathematics material which has an impact on the difficulty of students answering the questions given to the teacher, many students are only fixated on one step in solving a problem or tend to only follow the example of the question given to the teacher. Mathematics learning at SMP Negri 2 Sepatan has not varied and the learning still applies lecture learning. Based on information from mathematics teachers, the learning method that has been used consists of lecture methods, expository methods, and problem solving methods that have recently been tried to be applied, but of the three methods, teachers do more lectures, questions and answers and exercises (assignments). Learning is still teacher centred where the teacher explains the entire material and students do the exercises given which makes students more passive. This is one of the causes of students' low creative thinking.

One model that is suitable for developing students' creative thinking skills is learning the polya model. Lesh and Zawojewski (in Hensberry and Jacobbe, 2012) say that, "the heuristics are intended to help students go beyond current ways of thinking about a problem … Polya's heuristics can be thought of as providing a language to help problem solvers think back about their problemsolving experiences." That is, the Polya model is an analytical procedure intended to help students to exceed the limits of the current way of thinking about a problem. Hensberry and Jacobbe (2012, p. 62) add that, "the heuristics thus allow students to describe their processes, reflect on them, and eventually develop flexible thinking and skills that can be drawn upon in future problem-solving situations." That is, through the Polya model allows students to explain the process, reflect, and ultimately develop flexible thinking and skills that can be used in subsequent problem-solving situations. The Polya model is considered appropriate because its stages provide guidance to students to be able to solve a

Mathematics problem. Polya (in Billstein et al., 2007) revealed that the stages of the Polya model include, "understanding the problem, devising a plan, carrying out the plan, looking back" (I Kd. Agus Mustika and Pt. Nanci Riastini, 2017).

Referring to the steps of the Polya model, students will be directed to have the ability to think creatively in problem solving. Regarding the application of the steps of the Polya model, Saiful (in Marlina, 2013) said that, "students will get used to doing problems that not only rely on good memory, but students are expected to relate them to real situations they have experienced or have thought of." In addition, learning the Polya model can also develop curiosity, attention and interest, as well as foster tenacity and confidence in improving students' thinking skills.

Based on the background of the problems described above, one solution to overcome these problems is to improve the learning process. Improving the ability to think creatively is a high-level intellectual skill that is impossible to achieve by simply applying ordinary learning but needs to apply the learning process appropriately and accordingly. Therefore, researchers will conduct a study entitled "Application of Polya Model Learning to improve Students' Creative Thinking Ability."

METHODS

The method used in this study is Quasi Experiment Design, which is a method that does not allow researchers to fully control the research system, because in reality it is difficult to get the control group used by the research (Sugiyono, 2018). Where different treatment was given to two groups, namely learning treatment using Polya Model learning in experimental classes while in control classes lecture learning models were given.

The experimental design used in this study was a non-equivalent pretest-post test control group design. This study began by giving an initial test (pretest) given to two groups, then gave special treatment to the experimental class and ended by giving a final test (posttest) to both groups.

Table 1. Research Design

Group	Pretest	Treatment	Post test
Experiment	1		2
Control	3	–	4

The population in this study is grade VIII students of SMP Negeri 2 Sepatan semester 2 of the 2022/2023 academic year, totalling 376 students. Sugiyono (2017) defines sample as part of the number and characteristics possessed by the population (p. 81) sample in this study was randomly selected (Cluster *Random Sampling)* by researchers and subject teachers against available classes. Thus, the sempel used in this study is one class as an experimental class and one class as a control class.

The data collection technique in this study used a description test to measure students' creative thinking skills on the Build a Flat Side Space material. This test was given before and after treatment to both the experimental group and the control group. The questions given are in accordance with the indicators of creative thinking. Before the instrument is used to obtain data, it is first tested to determine validity and reliability to prove that this data collection instrument is good.

The data analyzed is quantitative data in the form of test results of students' creative thinking skills. Before the research data is processed, several things must first be prepared, including: making a table of pretest and posttest scores of experimental and control class students, and comparing pretest and posttest scores to find an increase (gain) consisting of afterwards which is calculated by the normality gain formula as follows

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(Lestari &; Yudhanegara, 2017)

Furthermore, the data in the Test uses the Prerequisite Test, namely the Normality Test, the Normality Test is carried out to find out the data from the research obtained is normally distributed or not. In the Normality Test, researchers use the SPSS program, then also with the homogeneity test aims to find out whether the two groups studied have the same variance or not. If both groups have the same variance then the group is said to be homogeneous.

Continued Test the hypothesis used in this study if the n-gain data is normally distributed and homogeneous, then using the Independent T-Test. Meanwhile, if one or both of the normality results of n-gain data are not normally distributed, then using a non-parametric statistical test with the Man Whitney U. test (Lestari &; Yudhanegara, 2017).

RESULTS AND DISCUSSION

The result of this study is the application of polya model learning to improve students' creative thinking skills in class VIII even semester at SMP Negeri 2 Sepatan. The mathematical material taught in this study is flat side space building material.

Both classes were given a pretest, given the same questions to see the initial abilities of both classes, then given different treatment, then given a final test (post-test), as well as the pretest, on the post-test also both classes were given the same questions to see the students' abilities after learning in the experimental class and the control class.

The following are the results of calculating pretest and post-test values in the experimental class and control class.

Table 2. Descriptive Pretest Data
Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pre-Test Experiments	44	8	54	33	9,57
Pre-test controls	43	8	50	32,98	9,721
Valid N (listwise)	43				

Table 3. Descriptive Data post-test
Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Post-Test Experiments	44	25	79	53,64	13,853
Post-Test Control	43	17	67	38,07	12,525
Valid N (listwise)	43				

Based on the pretest results, it is known that the average value of the control class is 32.98 and the experimental class is 33.00, while the posttest results are known to have an average value of the control class of 38.07 and the experimental class of 53.64. There was a difference in the average test of creative thinking skills of control class students and experimental classes due to differences in treatment in the learning process. In the experimental class, the polya model learning treatment was given and the control class was given the lecture model learning treatment.

The prerequisite tests and hypothesis tests that have been carried out are as follows:

Table 4. Normality Test

Tests of Normality

Class		Kolmogorov-Smirnova		
		Statistic	df	Itself.
Results of Creative Thinking Ability	Pre-Test Experiments	0,114	44	0,186
	Pre-test controls	0,127	43	0,079
	Post-Test Experiments	0,081	44	,200*
	Post-Test Control	0,114	43	0,186
n_Gain	Experiment	0,097	44	,200*
	Control	0,109	43	,200*

Based on the table above, it can be seen that the data of the pretest, posttest, and n-Gain results of the normality test calculation using *Kolmogorov-Smirnov* on the three data obtained that the significant value > 0.05. This indicates that the data is normally distributed.

Table 5. Homogeneity Test

Test of Homogeneity of Variance

			Levene Statistic	df1	df2	Itself.
Results of Creative Thinking Ability	Based on Mean	Pretest	0,013	1	85	0,909
		Post	0,194	1	85	0,661
		n_Gain	0,731	1	85	0,395

Based on the table above, it can be seen that the calculation results show a significance value (Sig) Based on *Mean* ≥ 0.05. Then it can be concluded that the second variance is homogeneous. From the results of a homogeneous variance test.

Table 6. Calculation Results t Test Pretest Data
Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
								Std. Error Differ ence	95% Confidence Interval of the Difference	
		F	Itself.	t	df	Sig. (2-tailed)	Mean Differ ence		Lower	Upper
Results of Creative Thinking Ability	Equal variances assumed	0,013	0,909	0,011	85	0,991	0,023	2,068	-4,089	4,135
	Equal variances not assumed			0,011	84,871	0,991	0,023	2,069	-4,090	4,136

Based on the table above, it can be seen that the significance value of the *t-test 0.05* > which is 0.991 0.05 is accepted and rejected. So based on the testing criteria, it can be

concluded that there is no difference in the initial ability of students' creative thinking ability between students in the experimental class and the control class. $>_{01}$

Table 7. Calculation Results of Protest Data t Test
Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
								Std. Error Differ ence	95% Confidence Interval of the Difference	
		F	Itself.	t	df	Sig. (2-tailed)	Mean Differ ence		Lower	Upper
Results of Creative Thinking Ability	Equal variances assumed	0,194	0,661	5,494	85	0,000	15,567	2,833	9,933	21,200
	Equal variances not assumed			5,500	84,495	0,000	15,567	2,830	9,939	21,194

Based on the table above, it can be seen that the significance value of the *t-test 0.05* ≤ which is 0.000 0.05 is rejected and accepted. So based on the testing criteria, it can be

concluded that there are differences in the final ability of creative thinking of students who are given polya model learning and students who are given lecture model learning. ≤ 0,1

Table 8. Test t Data N-Gain Students' Creative Thinking Ability
Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Itself.	t	df	Sig. (2-tailed)	Mean Differen ce	Std. Error Differen ce	Lower	Upper
n_Gain	Equal variances assumed	0,731	0,395	4,808	85	0,000	0,22870	0,04757	0,13412	0,32328
	Equal variances not assumed			4,815	84,131	0,000	0,22870	0,04750	0,13425	0,32316

From the table above it can be seen that the value of *sig. (2 tailed)* is 0.000 thus indicating that the value of Sig. 0.05 or 0.000 0.05. Thus, according to the hypothesis, it is rejected and accepted. From this statement, it can be concluded that the increase in creative thinking ability of students who get polya model learning is better than students who get lecture model learning.$\leq \leq_{01}$

CONCLUSION

Conclusion

Based on the results of research that has been carried out, it shows that:

1. There is a difference in the final ability of creative thinking of students who use polya model learning with those who use lecture model learning.

2. The increase in creative thinking ability of students who were given polya model learning was better than students who were given lecture model learning.

Suggestion

Based on the results of this study, the following suggestions were put forward:

1. This research is only limited to Build a Flat Side Space. It is expected that other researchers will develop on other materials.

2. In this study, only students' creative thinking skills were studied, it is hoped that other researchers will examine the use of Polya model learning in improving other abilities.

3. It is better for the teacher to always control the students during the discussion, so that all students can work well together regardless of the student's ability level.

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