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Effect Size Model Open Ended Learning on Creative Thinking Ability of Elementary School Students

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Abstract: This study aims to analyze the model Open Ended Learning to improve the creative thinking skills of elementary school students in mathematics. The research method used was an experiment with the One Group Pretest Posttest Design. The population of this study was all 23 students of grade IV, with the sampling technique used was saturated sampling. The research instrument used a written test in the form of an essay. The data analysis technique of this study used statistics with SPSS 25.0 for Windows normality test Kolmogorov-Smirnov, One-Way Anova, Paired t-test, and Effect Size. The results of this study indicated a positive influence of Open-Ended Learning on increasing students' mathematical creative thinking skills. It is evidenced by the results of the Cohen's Effect Size test, which was 2.930 with the range of criteria in the Cohen's, namely the size was more significant than 1.00. It was classified as high based on the effect size, indicating that the use of the Open-Ended Learning learning model has a strong influence on the improvement of students' mathematical creative thinking skills.

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Introduction

Education is an essential part of life because education can create a generation that is intelligent and able to develop self-potential in creative thinking. Implementing education so that it runs well and achieves educational goals requires attention to the teaching materials in the components of the educational curriculum in teaching and learning activities. Learning material that is very important for life is mathematics. According to the statement (Suryana, 2022), the fact is that mathematics is necessary for the development of creative thinking in life and all other aspects. At the basic level, aspects of ability in mathematics include cognitive, affective, and psychological aspects (Nawafilah & Masruroh, 2020). Mathematics is general knowledge, forms the basis for modern development, and plays an essential role in human creative thinking (Ninawati, 2017). Based on this (Ninawati, Yugianti, et al., 2018), it is stated that mathematics is a tool, a way of thinking, and a scientific function. Learning mathematics aims to develop good thinking skills in systematic, rational, creative, disciplined, and efficient collaboration (Handoko, 2017). In addition to the function of mathematics, elementary school students study mathematical topics to solve problems. The subject forms students' personalities to think independently and creatively (Silviani et al., 2018). Therefore, all students at any level of education, especially elementary school education, are required to study mathematics (Pratiwi et al., nd).

What must be developed in teaching and learning mathematics is the ability to think creatively to improve the skills needed by students. According to Munandar (in Nada et al.,

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2018), the importance of creative thinking can create someone who can renew himself in creative thinking to solve various problems in his life. Creative thinking is the key to designing, implementing changes, and obtaining new ideas (Hasanah, 2021). Types of thinking in creative thinking lead to obtaining broad perspectives, new ideas, or new ways of understanding things (Putri et al., 2019). Creative thinking is also helpful for adding new information to one's life and creating solutions in solving math problems. The goal of achieving the creative thinking skills needed by mathematics is that students are active during the learning process. In general, according to (Faelasofi, 2017), there are four types of indicators to assess mathematical creative thinking skills:

(1) Fluency, students' skills in answering math problems correctly.
(2) Flexibility, students' skills in solving problems in a variety of different ways.
(3) Originality, students' skills to find new and original answers or ideas.
(4) Elaboration (Elaboration), students' skills to articulate ideas/answers in detail.

Through creative thinking skills, students naturally learn to analyze math problems from their point of view and then come up with the right solutions. With the skills acquired, students can come up with creative ideas to produce different results that are clear, unusual, original, and precise when solving problems. The importance of students' mathematical creative thinking is because it can facilitate problem-solving in various ways (Happy & Widjajanti, 2014).

Creative thinking skills need to be developed in schools. Based on the results of pre-research observations in class IV MI Al-Mubarokah, field data show that "creative thinking in students' mathematics is still low (Amalia et al., 2014)". Students who are passive in learning in class make it difficult for students to understand what the teacher is teaching. This problem arises because creative thinking is not considered when teaching mathematics (Saefudin, 2012). Students generally assume that mathematics is only a collection of formulas that must be memorized without knowing the benefits (Magelo et al., 2019). Research conducted (Apriansyah & Ramdani, 2018) found that in the creative thinking abilities of MTs, students stated that the ability to think creatively in mathematics was still low because it focused more on the teacher only. Students needed to be more involved in problem-solving. The teaching and learning activities process still needs to improve in the use of learning models resulting in the delivery of material being monotonous without any innovative changes in learning. The results of this learning are passive students; students tend to be lazy to solve problems, students only imitate what the teacher says, students have difficulty understanding mathematics, so creative thinking does not develop (Utami et al., 2020). For things that encourage higher mathematical abilities in creative thinking, students are presented with the problem of finding answers to a given problem. If students find their answers to the problems given, it helps them in the future life to deal with them.

It requires reasonable efforts to develop students' creative thinking. The way to develop students' creative math skills is to create a friendly learning and teaching environment that provides serenity and comfort. These characteristics make Open Ended the most suitable for the above problems. Open-ended learning is a problem with more than one way to solve (Suryaningsih & Astuti, 2021). The learning objectives of Open-Ended Learning encourage students to be actively involved in creative activities and think mathematically through problem-solving. By applying this learning model, students are presented with open questions and encouraged to find solutions or answers to problems so that they can think of problem solutions in different ways, but the results are always correct.

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Previously, this learning model was studied by (Lisenia Monika Saragih & Anzelina, 2021), who successfully applied this learning model to thematic material.

This study aims to analyze the effect of Open-Ended Learning on improving elementary school student's mathematical creative thinking skills on KPK FPB material. This research was conducted to find out the difference in the results of students' mathematical creative thinking skills using Open Ended Learning, which is better than before using Open Ended Learning. This research is expected to positively impact the ability to improve students' mathematical creative thinking. It is consistent with the research (Panuntun Hsm et al., 2021) that the Open-Ended Learning model is suitable for increasing creative thinking skills.

Research Method

This research method used a quantitative experiment with a Pre-Experimental One Group Pretest-Posttest Design using one group. The treatment results were collected to be compared by conditions before and after treatment (Sugiyono, 2016). The design plan is shown in Figure 1 (Ninawati, Suryadi, et al., 2018). In this research design, two stages were carried out, namely the Pre-test (O_1) and Post-test (O_2) (Suarni et al., 2021). The population was all fourth-grade students of Madrasah Ibtidaiyah in 2021/2022. Technique sampling used saturated samples or all population members as samples (Sugiyono, 2016). The sample for this study included all Class IV by number 3 students.

O_1	**X**

Picture 1. Design One Group Pretest-Posttest

Information:
O_1: Pretest before treatment
X: Treatment using the Open-Ended Learning
O_2: Posttest after treatment

The instrument for measuring students' mathematical creative thinking skills was a subjective test in the form of essay questions. The number of essay questions was divided into six categories based on the criteria for indicators of the ability to think creatively in mathematics, namely the criteria for fluency (items 1 and 2), the criteria for authenticity (items 3 and 5), the criteria for flexibility (item 4) and the elaboration criteria (item 6). Test data on the ability to think creatively in mathematics has a category interpretation presented in table 1 (Hasanah, 2021). Processing of mathematical creative thinking ability test results through the Kolmogorov-Smirnovhomogeneity test One-Way ANOVA, Paired t-test, and Effect Size assisted by SPSS 25.0 for windows.

Table 1. Categories of Mathematical Creative Thinking Ability

Percentage	***Category***
81% - 100%	Very Good
61% - 80%	Good
41% - 60%	Fair
21% - 40%	Poor

Result and Discussion

Model Open Ended Learning on students' mathematical thinking creativity before and after its application (treatment). Pretest and Posttest score data were obtained through six

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essay questions for each test. This research first conducts validity before giving pretest and posttest questions. The results of the pretest and posttest scores are shown in Table 2.

Table 1. Score of Pretest and Posttest

Name	Pretest	Posttest
AAP	73	95
AAS	95	100
APM	78	95
AM	80	100
DAR	76	98
D	70	95
JA	75	95
KRH	80	100
MGR	50	50
MAHR	63	83
MA	75	100
MRR	48	60
MWD	70	85
NNP	79	95
NS	76	95
NFK	70	95
NDS	70	83
NSI	76	95
STS	78	100
SNA	73	95
TA	72	90
YSP	64	78
ZOC	76	95
%	72%	90%

Based on the result, the researcher has calculated the Kolmogorov-Smirnov calculation with the help of SPSS 25.0 to determine whether the data is distributed normally or not. The calculation results are shown in Table 3. Sig. (2-tailed) indicates 0.052 > 0.05, which allows us to conclude that the data distribution is normal. After the normality test, a homogeneity test was carried out to check whether the data variants from the population have the same (homogeneous) or not. Consistency checks were carried out when the data met the standard requirements and was reported as normal. The homogeneity test used One-Way ANOVA, calculated using SPSS 25.0 with a significance level of 0.05 or 0.025. Based on table 4, data on mathematical creative thinking skills at Sig. If 0.311 > 0.05, it can be concluded that the data variance for mathematical creative thinking ability is homogeneous.

Table 2. Normality Test Kolmogrov-Smirnov

Class		*Kolmogrov-Smirnov*		
Mathematical Creative Thinking Ability	IV	Test Statistic	df	Sig. (2-tailed)
		.180	23	.052

Table 3. Homogeneity Test Results

Test of Homogeneity of Variance					
Mathematical Creative Thinking Abilit	*Based on Mean*	*Levene Statistic*	df1	df2	Sig.
		1.050	1	44	.311

After the normality and homogeneity tests were carried out, the hypothesis test in this study was the Paired sample t-test supported by SPSS 25.0. This test was conducted to determine

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the effect of Open-Ended Learning on fourth-grade students' mathematical creative thinking skills. The results of the hypothesis test in table 5 show the Sig. (2-tailed) of 0.000. Based on the significance level of Paired sample t-test Sig. (2-tailed) < 0.05, then rejected and accepted. Based on this, there is a significant difference, meaning that the use of Open-Ended Learning positively affects the ability to think creatively in mathematics for class IV.

Table 4. Hypothesis Test Paired Sample T-Test

	Paired Differences				
Mathematical Creative Thinking Ability	*Mean*	*Std. Deviation*	*T*	*df*	*Sig. (2-tailed)*
	-17.826	6.080	-14.061	22	.000

Table 5. Criteria Effect Size

Size	Criteria
0-0,20	Weak
0,21-0,50	Enough
0,51-1,00	Moderate
>1,00	High

(Dini et al., 2019)

Based on the data above, the results of calculating the Effect Size using Cohen's give an Effect Size of 2.930. Based on the results of these calculations, the criterion scale in the Cohen's was more significant than 1.00, which was classified as very high, as shown in table 6 regarding the increase in students' creative thinking in turning off the material on the fourth graders of Madrasah Ibtidaiyah Madrasah Ibtidaiyah Al-Mubarokah. It is evidenced by an increase in the average post-test score of students after using the open-ended learning compared to the average pretest of students before using the open-ended model. The results of relevant research that has been done previously show that the use of the Open-Ended Learning model is known to increase students' curiosity and mathematical creative thinking process skills (Saironi & Sukestiyarno, 2017). Therefore, based on the research that researchers have carried out at MI Al-Mubarokah, open-ended learning is beneficial for students in improving their mathematical high-level creative thinking skills through a problem so that learning becomes effective.

Conclusion

The results of this study indicated a positive influence of the application of Open-Ended Learning on increasing the ability to think creatively in mathematics of fourth-grade students. These results are proven based on pretest data and posttest data on the Paired Samples Test using SPSS 25.0 for windows showing a sig. (2-tailed) 0.000 <0.05 concluded that there was a significant difference in the increase in mathematical creative thinking skills in the Pretest and Posttest data, meaning that the use of Open-Ended Learning influences the increase in students' mathematical creative thinking skills. It is related to the KPK FPB grade IV material at Madrasah Ibtidaiyah academic year 2021/2022. Based on the Effect Size test calculation, it was known that the Effect Size test results are 2.930 > 1.00. It is concluded that the Effect Size test value is high, meaning that the use of Open-Ended Learning has a strong influence on increasing the ability to think creatively in mathematics of fourth-grade students on kpk fpb material in Madrasah Ibtidaiyah.

Recommendation

The recommendation given is based on the results of this study, namely (1) For school principals, this research can be a guide for schools to use this learning model in improving

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students' mathematical creative thinking skills. (2) Teachers are expected to be able to apply the Open-Ended Learning in mathematics subject matter KPK FPB to develop highly creative thinking in solving problems. (3) For students by using Open Ended Learning, students are expected to understand the material well and carry out meaningful, efficient, and enjoyable learning.

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