

The Effect of the Problem Posing Learning Model on the Critical Thinking Skills of Fifth Grade Students in Mathematics

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Abstract

The learning process applied by educators has varied in the use of learning models; however, students' critical thinking skills are still considered low. In light of this issue, the researcher attempted to implement a learning process using a model that had never been used by educators before, namely the problem posing learning model. This study aims to examine the effect of the problem posing learning model on the critical thinking skills of fifth-grade students in mathematics at MIN 10 Bandar Lampung. The research employed a quantitative approach with a quasi-experimental design (post-test only control group design). The study was conducted at MIN 10 Bandar Lampung, specifically in the fifth grade, involving two classes as the experimental and control groups, as well as an additional class for validation purposes. The instruments used in this study included tests. Data analysis was performed using the t-test. The results showed that the normality test yielded values of 0.180 and 0.054, both greater than 0.05, indicating that the data were normally distributed. The homogeneity test showed a value of 0.918, which is also greater than 0.05, indicating that the data were homogeneous. The hypothesis test using the Independent Samples t-Test resulted in a value of 0.000, which is less than 0.05, meaning that the null hypothesis (H_0) was rejected and the alternative hypothesis (H_a) was accepted. Therefore, it can be concluded that there is a significant effect of the problem posing learning model on the critical thinking skills of fifth-grade mathematics students at MIN 10 Bandar Lampung.

Keywords: Critical Thinking, Mathematical Problem Posing

Abstrak

Proses pembelajaran yang diterapkan oleh pendidik sudah bervariasi dalam penggunaan model pembelajaran, namun berpikir kritis peserta didik masih tergolong rendah. Mengingat permasalahan ini, peneliti mencoba menerapkan proses pembelajaran dengan model yang belum pernah digunakan oleh para pendidik sebelumnya, yaitu model pembelajaran *problem posing*. Penelitian ini bertujuan untuk menanamkan pengaruh model pembelajaran *problem posing* terhadap keterampilan berpikir kritis peserta didik mata pelajaran matematika kelas V di MIN 10 Bandar Lampung. Jenis penelitian yang digunakan adalah kuantitatif dengan desain quasi eksperimen (*post-test only control design*). Penelitian ini dilaksanakan di MIN 10 Bandar Lampung, khususnya di kelas V, dengan melibatkan dua kelas sebagai kelompok eksperimen dan kontrol, serta satu kelas tambahan sebagai kelas validasi. Instrumen yang digunakan dalam penelitian ini mencakup tes. Teknik analisis data dilakukan dengan uji-t. Hasil penelitian menunjukkan bahwa uji normalitas menghasilkan nilai sebesar 0.180 dan 0.054 yang berarti $> 0,05$, yang berarti data berdistribusi normal. Uji homogenitas menunjukkan nilai $0,918 > 0,05$, yang berarti data bersifat homogen. Hasil uji hipotesis dengan

uji *Independent Sampel T Test* menghasilkan nilai $0,000 < 0,05$, yang berarti H_0 ditolak dan H_a diterima, sehingga dapat disimpulkan bahwa terdapat pengaruh signifikan terhadap keterampilan berpikir kritis peserta didik mata pelajaran matematika kelas V di Min 10 Bandar Lampung.

Kata Kunci: Berpikir Kritis, Matematika Problem Posing

Introduction

Education is a learning process aimed at shaping individuals to have skills, attitudes, insights, and comprehensive thinking abilities (Ihsan et al., 2024). In this modern era, students are required not only to master knowledge but also to have high critical thinking skills (Ngatminiati et al., 2024). These skills are crucial for analyzing problems and finding solutions. Additionally, critical thinking skills are an essential element in an individual's life, as they can foster resilient thinkers and effective problem solvers (S. Latifa et al., 2021). Therefore, the development of critical thinking skills must be one of the main focuses in the learning process at school, especially at the elementary level. With critical thinking skills, a person can make more accurate and wise decisions when facing various situations (Salsa Novianti Ariadila et al., 2023).

Critical thinking skills are necessary for students in dealing with problems, including analytical abilities to identify problems, respond to them, and propose ideas that can solve them (Amroni et al., 2024). These skills include the ability to evaluate evidence, analyze invalid assumptions, and draw logical conclusions (Puling et al., 2024). Currently, critical thinking skills are one of the skills that must be developed and honed through various experiences and learning activities carried out at school, especially in developing students' critical thinking skills in mathematics (Alani, 2024).

Based on the results of a preliminary study conducted through observation and interviews with mathematics teachers of grade V at MIN 10 Bandar Lampung, namely Mrs. Imelrisda, S.Pd, and Mrs. Siti Annisa, S.Pd, conducted on November 18–20, 2024, several weaknesses were identified in the mathematics learning process that contribute to the low critical thinking skills of students. Some of the identified problems include: (1) differences in students' understanding of the material, which is the cause of low critical thinking skills in mathematics, (2) inappropriate learning models that hinder the delivery of material and learning objectives that can improve students' critical thinking skills, (3) ineffective classroom management that causes students to not pay attention to the teacher's explanations during the learning process. To support students' critical thinking skills, it is necessary to adopt a learning model that facilitates their understanding of the material and encourages cooperation. One solution to overcome obstacles in the learning process and improve student achievement is to implement a learning model. On the other hand, a comprehensive and integrated learning model is also key to improving the quality of learning. One example of a learning model that can be applied is the problem-posing learning model. The problem-posing learning model is a learning model that can be used to improve students' critical thinking skills (Christidamayani & Kristanto, 2020). This model emphasizes problem posing by students, where they are encouraged to formulate questions based on the given situation and seek solutions independently. The response takes the form of answers to the questions (Husna, 2022). This model is highly suitable

for mathematics learning in elementary schools, with the aim of improving students' understanding of the material through a series of activities in problem-posing learning (Agustina & Lestari, 2020).

Research conducted by Khoridatul Azimah et al. (Azimah et al., 2023), Akbar Hidayat et al. (Hidayat et al., 2021), Andi Subaedah (Subaedah, 2022), Kurnia et al. (Kurnia et al., 2023) and Emi Yulifa (Yulifa et al., 2022) reveal the potential of the problem-posing learning model in improving student learning outcomes. These studies have primarily focused on improving learning outcomes and have not specifically investigated critical thinking skills. Although numerous studies have examined the impact of the problem-posing learning model, there remain limitations in understanding its specific effects on critical thinking skills in mathematics. This study was conducted with fifth-grade students, which is an important phase in children's cognitive development. By focusing on this age group, this study can provide new insights into the influence of the problem-posing model on the development of critical thinking skills in students who are in transition between primary and secondary education. The application of this model is expected to be one of the alternative choices in learning to improve the quality of education in Indonesia, especially in mathematics learning.

This research needs to be conducted because the researcher investigates the influence of the problem-posing learning model on students' critical thinking skills. The application of the problem-posing learning model encourages students to think critically during the learning process and allows them to express their personal views without being bound to a single way of understanding (such as memorization). The implication of this research is the importance of applying effective learning models in mathematics learning and the need for teachers to play a role in designing more innovative learning models to create a learning atmosphere that is not boring. The problem-posing learning model requires students to formulate questions and solve problems independently, which encourages them to be actively involved in the learning process. The problem-posing learning model not only focuses on problem solving but also encourages students to ask their own questions (Laia et al., 2024). Thus, students can not only understand mathematical concepts but also hone their analytical and creative skills. Therefore, this study aims to contribute to the world of education by applying a structured learning model to provide broader insights into how the problem-posing learning model can improve students' critical thinking skills in mathematics, making them more innovative and creative in the future.

Method

This study uses a quantitative research approach of the Quasy Experimental Design type. The experimental design used by the researcher is the post-test only control design (Abraham & Supriyati, 2022). In this study, the researcher selected the sample using probability sampling, choosing two sample groups, where one class served as the experimental class and the other as the control class. The sample data obtained through probability sampling were from classes VA and VB. The class used as the control class with the learning model applied by the teacher was class VB, while the class used as the experimental class with the problem-posing learning model was class VA. The instrument used in this study was a test consisting of essay questions or

descriptions based on critical thinking skill indicators. The test instrument underwent validity, reliability, difficulty level, and discriminative power tests before being distributed to ensure data reliability. The prerequisite analysis used normality and homogeneity tests. The hypothesis test used a t-test.

Results and Discussion

This study was conducted at MIN 10 Bandar Lampung, aiming to examine the effect of the problem-posing learning model on students' mathematical critical thinking skills. The study involved two classes with different treatments: Class VA as the experimental class implementing the problem-posing learning model, and Class VB as the control class using the direct instruction learning model. The flat shape material was taught in five meetings in each class. A posttest was administered after the teaching of the material. Students' critical thinking skills were assessed through the average test scores, with the posttest consisting of essay or descriptive questions covering indicators of critical thinking skills. The results of the posttest are as follows.

Table 2. Analysis Result

	N	Minimum	Maximum	Mean	Std. Deviation
Control Class	30	0	81	17.90	19.760
Experimen Class	30	20	90	70.13	18.556

Based on the data in Table 3 above, it shows that the average posttest score in the experimental class, which is 70.13, is higher than the posttest score in the control class, which is 17.90. The posttest results of this study indicate that the problem-posing learning model has an effect on the critical thinking skills of mathematics students at MIN 10 Bandar Lampung compared to the direct instruction learning model. The direct instruction learning model showed lower results, while the problem-posing learning model showed higher results.

Preliminary Test Results

1) Normality Test

The normality test was used to ensure that the collected data were normally distributed. Data were considered normally distributed if the significance value (sig.) obtained was greater than 0.05. The results of the normality test for critical thinking skills in mathematics for fifth grade can be seen in Table 3.

Tabel 3. Test of Normality
Tests of Normality

	Class	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Result	Post Test Kelas Kontrol	.106	30	.200	.951	30	.180

Post Test Kelas Eksperimen	.135	30	.174	.931	30	.054
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a. Lilliefors Significance Correction

Based on the results in Table 3 above, the Shapiro-Wilk significance values obtained in the control and experimental classes were 0.180 and 0.054, respectively. Both values are greater than 0.05, indicating that the data in the control and experimental classes are normally distributed.

2) Homogeneity Test

The homogeneity test was conducted to determine whether the data variation was uniform (homogeneous) or diverse (non-homogeneous). Data is considered homogeneous if the significance value (sig) obtained is greater than 0.05. The results of the homogeneity test for fifth-grade mathematical critical thinking skills can be seen in Table 4.

Tabel 4. Test of Homogeneity

Test of Homogeneity of Variance					
Levene					
		Statistic	df1	df2	Sig.
Hasil	Based on Mean	.011	1	58	.918
	Based on Median	.447	1	58	.506
	Based on Median and with adjusted df	.447	1	53.528	.506
	Based on trimmed mean	.095	1	58	.759

Based on the data in Table 4, the homogeneity test produced a significance value of 0.918, which is greater than 0.05. Thus, it can be concluded that the data on critical thinking skills in mathematics for grade V MIN 10 Bandar Lampung is homogeneous, which is supported by a sig (2-tailed) value of $0.918 > 0.05$.

3) Hypothesis Test

In this hypothesis test, the Independent Sample T Test was used. The T test aims to determine whether the independent variable has an effect on the dependent variable. The results of the T test on the critical thinking skills in mathematics for fifth grade can be seen in Table 5.

Table 5. Independent Sample T Test
Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Hasil	Equal variances assumed	.011	.918	-10.554	58	.000	-52.233	4.949	-62.140	-42.327
	Equal variances not assumed			-10.554	57.772	.000	-52.233	4.949	-62.141	-42.326

Based on the data presented in Table 5, a significance value (sig) of 0.000 was obtained, which is smaller than the probability value of 0.05. Thus, it can be concluded that H0 is rejected and Ha is accepted. This indicates that there is an influence between the problem posing learning model (X) and critical thinking skills (Y).

The results of the study indicate that the problem-posing learning model has a significant effect on students' critical thinking skills in mathematics. The experimental class, which used this learning model, showed greater improvement compared to the control class. This is because students in the experimental class were better trained in solving critical thinking problems related to everyday life. The process of asking questions from existing problems helps students solve the problems, so they better understand the steps from the beginning to the end of solving the problems (Irminda Veronika Uskono, et al., 2020). Thus, problem posing is effective in developing students' critical thinking skills in mathematics more effectively.

These results are in line with the findings of a study conducted by Ayu Herlina, Y, Herlina, and Cucun Sunaengsih (Ayu Herlina et al., 2023), which showed that the use of the Problem Posing learning model can improve students' critical thinking skills. Research conducted by Fanny Rahmatina Rahim and Shahrul Kadri Ayop (Rahim & Ayop, 2023) shows that the use of the Problem Posing learning model can enhance students' critical thinking skills. Research conducted by Ericha Windhiyana Pratiwi (Ericha Windhiyana Pratiwi et al., 2021) reveals that the use of the Problem Posing learning model influences the critical thinking skills of fifth-grade elementary school students. Research conducted by Khoridatul Azimah, Irwani Zawawi, and Sri Suryanti (Azimah et al., 2023) shows that the Problem Posing learning model has an impact on improving the learning outcomes of fifth-grade MI students. Research conducted by Wiwik Elphina and Ikhsan Maulana (Elphina et al., 2023) shows that the problem-posing model can increase learning activities among fifth-grade students.

Although the problem-posing learning model has the potential to improve students' critical thinking skills in mathematics, its implementation requires the active role of teachers in providing guidance, support, and constructive feedback during the

problem-solving process. Research on the influence of this model has limitations because it was conducted with a small sample. Therefore, these findings may not be generally applicable to all student populations, so further research on a larger scale is needed to understand the proposed problem-posing learning model more comprehensively. This research is expected to provide new knowledge for educators on the use of innovative and creative learning models that can improve students' critical thinking skills.

Conclusion

Based on the analysis and discussion, this study concludes that the problem-posing learning model has an effect on the critical thinking skills of mathematics students at MIN 10 Bandar Lampung. The Independent Sample T Test yielded a significant value of 0.000, which is less than 0.05 (H_0 rejected and H_a accepted), indicating that there is a significant effect of the learning model. This study shows that the problem-posing learning model has a positive impact on students' critical thinking skills in mathematics related to plane figures.

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