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The Impact of The Problem Posing Learning Method on Critical Thinking Skills in Terms of Self-Confidence

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ABSTRACT
Elementary school students are still difficult to solve math description problems because of weak critical thinking skills. The lack of application of appropriate learning methods in developing critical thinking skills and student self-confidence factors makes the low quality of the mathematics learning process. The purpose of this study is to analyze the application of the Problem Posing learning method to critical thinking skills reviewed from students' self-confidence in mathematics learning. The research methodology applied is an experiment with a 2 x 2 design. The research sample was selected using Cluster Random Sampling with a total sample of 140 elementary school students. The research instrument used was a critical thinking ability test in the form of description test questions and self-confidence questionnaires using the Likert scale. Data analysis began with prerequisite tests in the form of normality and homogeneity, followed by two-way ANOVA hypothesis tests and Tukey tests as further tests. The results showed that the critical thinking skills of students who were given treatment using the Problem Posing method were higher than students who were given expository learning treatment. The conclusion that the Problem Posing learning method has a significant effect on critical thinking skills in terms of self-confidence in elementary school students.
***Keywords**: Problem-Posing Learning Method, Critical Thinking Skills, Self-Confidence*

ABSTRAK
Siswa sekolah dasar masih sulit dalam penyelesaian soal uraian matematika karena lemahnya kemampuan berpikir kritis. Kurangnya penerapan metode pembelajaran yang tepat dalam mengembangkan kemampuan berpikir kritis serta faktor kepercayaaan diri siswa menjadikan rendahnya kualitas proses pembelajaran matematika. Tujuan penelitian ini adalah menganalisis peerapan metode pembelajaran Problem Posing terhadap kemampuan berpikir kritis ditinjaau dari self confidence siswa pada pembelajaran matematika. Metodologi penelitian yang diterapkan adalah eksperimen dengan design 2 x 2. Sampel penelitian dipilih menggunakan Cluster Random Sampling dengan total sampel berjumlah 140 siswa Sekolah Dasar. Instrumen penelitian yang digunakan adalah tes kemampuan berpikir kritis berupa soal tes uraian dan angket self confidence menggunakan skala

Likert. Analisis data diawali uji prasyarat berupa normalitas dan homogenitas dilanjutkan uji hipotesis ANOVA dua jalan dan uji Tukey sebagai uji lanjut. Hasil penelitian menunjukkan bahwa kemampuan berpikir kritis siswa yang diberikan perlakuan menggunakan metode Problem Posing lebih tinggi dibandingkan dengan siswa yang diberi perlakuan pembelajaran ekspositori. Simpulan bahwa metode pembelajaran Problem Posing berpengaruh signifikan terhadap kemampuan berpikir kritis ditinjau dari kepercayaan diri terhadap siswa SD.
Kata kunci: Metode Problem Posing, Kemampuan Berpikir Kritis, Self Confidence

INTRODUCTION

The ability to think critically is one of the important skills that must be possessed by students in this era of globalization (Assoc, 2018). Critical thinking enables students to analyze information in depth, evaluate arguments, integrate ideas and solve problems creatively (Le & Chong, 2024). However, based on the results of various studies, the critical thinking skills of Indonesian students are still relatively low. This is evidenced by the results of the Program for International Student Assessment (PISA) in 2018, where Indonesia ranked 62nd out of 78 countries in reading ability, 70th in mathematics ability, and 57th in science ability (OECD, 2019).

Students' critical thinking skills are important to improve as an investment in the nation's future (Indrawati & Kuncoro, 2021). Students with good critical thinking skills will become a generation that is able to compete in the global world and bring progress to the Indonesian nation (Malik, 2018). Improving students' critical thinking skills is a joint task by collaborating between teachers, parents, and the community (Thornhill-Miller et al., 2023). The way this is done is by creating a conducive learning environment and providing opportunities for students to develop their critical thinking skills (Jamil, et al., 2024).

The learning process in primary education directs students to be able to develop their potential. Math learning is one of the needs of students. Since elementary school, mathematics has benefited everyday life (Lestari et al., 2022). The importance of mathematics in everyday life makes mathematics a subject that every student must master. Mathematics is a science related to abstract concepts in the learning process associated with everyday life so that students can find ideas and develop their mathematical abilities based on their experience or knowledge (Mega & Faisal Madani, 2023). The field of mathematics taught in elementary schools includes three branches: arithmetic, algebra and geometry. Geometry helps students understand, describe, or describe the objects around them because their world comprises geometric shapes. Geometry is a fundamental component of mathematics education since it teaches the students critical thinking, problem-solving skills, and comprehension (Gunhan, 2014). Geometry material presented in a way that piques students' interest and inspires them to explore can help them develop their critical thinking skills and attitudes toward mathematics.

Learning mathematics, every student needs critical thinking to understand the material they learn. Critical thinking is rational and introspective thinking related to what to think and what to do (Almulla & Al-Rahmi, 2023). In elementary schools, mathematics learning also trains critical thinking skills, which aim to be the result of learning memorizing material, solving problems in everyday life, and even facing challenges in the 21st century (Anggreani

& Riduan Febriandi, 2023). Critical thinking is needed for students so that they are able to solve problems found in everyday life (Kurino & Herman, 2023)

Critical thinking is a high-level thinking talent that involves not only memorizing but also applying and demonstrating the material gained in new contexts. The acronym FRISCO to define the components of critical thinking skills: focus, reason, inference, circumstance, clarity, and overview (Robert Ennis, 1996). Students' critical thinking skills will influence their knowledge of the learning content and the learning outcomes that they achieve when learning mathematics. Fostering critical thinking requires focusing on the learning process, from learning to thinking to learning outcomes. Critical Thinking identified five components for assessing critical thinking skills, namely inference, assumption identification, deduction, interpretation, and argument evaluation (Watson & Glaser, 2008). A critical thinker can study and synthesize information in order to reach effective choices and answer troubles efficiently.

The results of observations on students in elementary school showed a category of low critical thinking skills when learning Mathematics (Maryani et al., 2024). The most students need help in understanding the problems found in group work so that tasks are completed independently. Students do description problems by writing answers briefly without using detailed and coherent steps. Students can conclude but have not formulated findings appropriately because they do not use appropriate supporting data. Students also cannot explain conclusions clearly and smoothly in accordance with learning objectives. In fact, some students are unable to evaluate errors in students' answers (Rizki & Suprapto, 2024).

Teachers in elementary schools must use educational strategies that promote the growth of pupils' critical thinking abilities. Teachers must appreciate the role of modification, reflection, and change in various learning processes, as students' ways of thinking can be influenced by fixed routines in teachers' teaching methods (Bezanilla et al., 2019). Critical thinking skills will arise if students are familiarized with problem-solving activities from their real-life images and experiences is Problem Posing (Hu & Hwang, 2024; Wilkie, 2024).

Problem-posing in the field of mathematics is a collection of actions that require pupils as well as educators to reformulate and explain an issue in a given context (Cai & Hwang, 2020). Applying the Problem-posing learning method directs students to think broadly when solving a problem. Furthermore, students might become more actively engaged in learning to better understand the principles gained (Kurino, n.d.). The problem-posing technique lets learners to see the application of math in reality through applying the concepts that they have learnt to everyday circumstances (Kovács et al., 2023).

Problem posing developed the “What If Not” strategy, a five-step problem-solving method (Brown & Walter, 2004). The What-If-Not technique instructs students to assess and revalue every element of the problem (information and issue question) by asking, "What if not?" (Lavy, 2015). Örnek and Soylu (2021) recommend using hierarchical stages in problem-posing learning is separated into Six phases are involved: identifying the ideal situation to pose a problem for, building the story, establishing the problem statement, answering the problem, assessing the problem, and completing the problem created.

Practical Problem Posing can create high-quality mathematics learning. Problem-posing provides opportunities to critically examine and interpret information, allowing students to separate significant data, uncover correlations integrate facts, pick relevant information to solve problems, and get data that is integrated (Bahtiar & Suryarini, 2019). Providing

opportunity for pupils to submit mathematical questions demands deep thinking and improves their critical thinking skills (Arıkan & Ünal, 2015).

The Problem Posing method, the utilization of GeoGebra online learning material can aid in the development of critical thinking ability. GeoGebra is a freely available math program by anyone with an internet connection; it supports the students' initial beliefs and rates answers differently (Hernández et al., 2020). The GeoGebra program includes tools that let both educators and learners are illustrate and display a variety of tasks. It has a favorable effect and helps deepen pupils' critical thinking (Alkhateeb & Al-Duwairi, 2019). This software differs from most math software because it focuses more on geometry.

Learning conducted by self-confident pupils will create a nice atmosphere. Self-confidence as a person's acceptance of their skills, both positive and bad, developed through learning to achieve happiness (Pečiuliauskienė, 2020). In general, pupils who are confident in their mathematical ability will feel more at ease when confronted with mathematical challenges. Self-confidence in learning math is a specific aspect of self-esteem related to how confident a person is in studying new mathematics topics or taking arithmetic tests (Reyes, 1984). Mathematics self-confidence is defined as pupils' judgments and beliefs about their capacity to perform well when faced with mathematical challenges (Pierce & Stacey, 2004).

Student self-confidence is seen as one factor determining student learning success (AItuga & Alman, 2023). Self-confidence in The process of classes mathematics is a major indicator of mathematics results since how well students do in mathematics usually corresponds to their unique level of self-confidence (Çiftçi & Yildiz, 2019). Students who have excellent math self-confidence believe they will benefit from their efforts, are afraid about learning difficult topics, receive to get good grades and enjoy math as a course of study.

This research is different from previous research, where the application of the problem posing method was applied in elementary schools by looking at students' confidence in learning Mathematics. Based on the above description, it will be investigated whether the problem-posing learning technique affects students' critical thinking skills as relation to self-confidence. It will also be determined whether the learning model and self-confidence have an interaction effect on students' critical thinking skills.

METHODS

Type and Design

This study included quantitative research using design 2x2 factorial experimental research design is employed in this study, along with an experimental methodology. The focus of this research design is to determine if the three variables under investigation are affected by the treatment. Two completely separate groups receiving two different therapies participated in this study. The control group received instruction using the expository learning method, whereas the experimental group was educated using problem-posing learning. The description of 2x2 Factorial Experimental Research Design is presented in teble 1 below:

Table 1. 2x2 Factorial Experimental Research Design

Class	Treatment	Posttest
Experiment	X_1	O_1
Control	X_2	O_2

Data and Data Sources

The data used in this study were test results and questionnaires in exploring the critical thinking skills of elementary school students through the problem posing method in mathematics learning. The study included all fifth-grade students from the SD Negeri Gunung Putri Area in Bogor Regency area, West Java Province. Samples have been selected using a cluster random sampling method. The samples collected were SDN Bojong Nangka 01 and SDN Bojong Nangka 02. SDN Bojong Nangka 01 locates at Kp Sanding, RT 02 RW 1 in Bojong Nangka. SDN Bojong Nangka 02 is positioned at Jl. Raya Bojongnangka RT. 15 RW. 07, Bojong Nangka. The sample size for this study was 140 students, with 35 students from SDN Bojong Nangka 01 and 35 students from SDN Bojong Nangka 02 as the experimental class. The control class sample includes 35 students from class VB SDN Bojong Nangka 01 and 35 students from class VB SDN Bojong Nangka 02.

Data collection technique

In this investigation, data were collected using two instruments, each of which was created in accordance with preset indicators. The instruments employed in this investigation are tests and questionnaires. The questionnaire utilized was a self-confidence indicator that consisted of 30 questions on a Likert scale. The Self-Confidence Indicator measures Bandura's three dimensions through scale items that include Self-Confidence and Confidence, initiating actions and influencing others, and achieving results (Enstroem & Benson, 2024). The tool takes the shape of an 8-question critical thinking skills exam. The specified material is the qualities and volume of the building space. The critical thinking indicators used refer to the quoted indicators Ennis (2011) include: 1) focusing questions, 2) analyzing arguments, 3) considering the credibility of the source, 4) compiling and considering induction, 5) identifying terms and considering definitions, and 6) determining an action.

Data analysis

This study's data analysis technique was carried out with multiple tests comprising of 1) Content validity test of the instrument questions and questionnaires tested by experts, namely UNJ postgraduate lecture; 2) Construct Validity Test using the product moment formula, which results from 8 valid critical thinking ability test items; 3) Reliability Test using the alpha formula which results in 0.786 with high reliability; 4) Test Distinguishing Power and Level of Test Difficulty The result is that eight questions have good differentiation with a medium level of difficulty. In addition, hypothesis precondition tests were performed, notably the normality and homogeneity tests. Once fulfilled, hypothesis testing can be done using the two-way ANOVA and Tukey tests. Calculation of data analysis testing for the four hypotheses using SPSS version 27 software.

This research focuses on four objectives: 1) Students treated with the Problem Posing learning technique have stronger critical thinking skills than students treated with the expository learning method; 2) The Problem Posing learning method and self-confidence have an interaction effect on students' critical thinking skills; 3) Students treated with the Problem Posing learning method have a higher critical thinking skills than students treated with the expository; and 4) Students treated with the Problem Posing learning method have a lower

critical thinking skills than students treated with the expository learning method in the group of students with low self-confidence.

RESULTS AND DISCUSSION

The results showed that critical thinking skills through the application of problem posing methods in experimental and expository in control classes can be seen in Figure 1 below: Figure 1. Chart Critical Thinking Skills on Experiment class and Control class.

Based on the data in Figure 1 reveal an average difference in critical thinking skills of 15.80. Furthermore, the experimental and control class data were separated into two groups based on self-confidence level. The findings of student questionnaire scores are used to sort the sampling of high and low self-confidence. The top and lowest 30% of the entire sample of each class are chosen. The description of students' critical thinking ability data based on high and low self-confidence is presented in Table 2 below:

Table 2. Description Critical Thinking Skills based on High and Low Self-Confidence

Self Confidence	Problem Posing Learning Method					Expository Learning Method				
		Std. Deviation	**Score Max**	**Score Min**	**N**		**Std. Deviation**	**Score Max**	**Score Min**	**N**
High	84,48	7,222	94	72	21	58,38	10.428	81	44	21
Low	64,10	9,565	81	47	21	72,53	9,595	84	50	21
Total	148,56					128, 91				

Based on data in Table 2 reveals student who got the Problem Posing learning method had better overall average critical thinking skills than those who received the expository learning method. Normality and homogeneity tests should be done before to doing a two-way ANOVA. The normality test results are presented in the following table 3 below:

Table 3. The Normality Test

Learning Methods	Statistic	dF	Sig.	Description
Problem Posing	0,095	42	0,076	Normal
Ekspository	0,115	42	0,052	Normal

The findings of the Shapiro-Wilk normality test in Table 3 show that the significant value derived from the experimental and control classes is greater than 0.05, specifically 0.076 for the Problem Posing learning method and 0.052 for expository learning. Thus, the critical thinking skills test data is drawn from a regularly distributed population.

The homogeneity test on this data is carried out with the help of SPSS by looking at the results in the homogeneity of variances test (Levene's) section presented in table 4 below:

Table 4. Homogeneity of Variances Test (Levene's)

Levene Statistic	df1	df2	Sig
0,723	3	40	0,541

Based on the data in table 4, the results of the homogeneity test obtained sig values 0.541 is greater than 0.05. As a result, all of the study's samples shared the same variance. Completion of prerequisite and homogeneity tests on the questions, can be carried out two-way ANOVA 2x2 test. The following test results with ANOVA are presented in table 5 below:

Table 5. Two-way ANOVA Test

Variabels	df	Mean Square	F	Sig.
Problem Posing	1	1755,429	18,620	0,001
Self Confidence	1	25,190	0,267	0,607
Problem Posing*Self Confidence	1	6309,333	66,925	0,001

According to table 5, The first hypothesis's a two-way ANOVA test yields a significance level of 0.001, which is less than 0.05. The hypothesis claims that using the Problem Posing method enables pupils to improve their critical thinking skills. Within comparison, H_0 states that using the Problem-Posing method has no impact on pupils' critical thinking skills. Thus, H_1 is approved whereas H_0 is denied. It is reasonable to conclude that problem-posing and expository learning methods create an impact on their critical thinking skills.

According to the calculations in Table 5, the two-way ANOVA test on the second hypothesis, the interaction between the Problem Posing and Self-confidence learning approaches has a significance level of 0.001. This value is less than the set threshold of 0.05. This suggest, the Problem Posing learning approach influences students' critical thinking skills and self-confidence.

In this research, the additional test used was the Tukey test. The outcomes of the Tukey test analysis high self Confidence with Problem Posing learning methods and Expository learning methods presented in table 6 below:

Table 6. Tukey Test High Self Confidence with Problem Posing Learning Methods and Expository Learning Methods

SC High PP	Mean Difference	Std.Error	Sig	Lower Bound	Upper Bound
SC High Exspository	26,48	2,996	<0,001	18,61	34,34

The Tukey test findings in table 6 on the third hypothesis demonstrate that students have outstanding self-confidence are treated using problem-posing learn strategy, while the expository learning method has a significance level of 0.001. This indicates that it is less than 0.05 determination value. For students with strong self-confidence, H_o is rejected, meaning that the average critical thinking skills of the student group treated with the Problem Posing learn technique are higher than the learner's score group handled with the expository learning method.

The next calculation to test the fourth hypothesis still uses the Tukey test. The outcomes of the Tukey test analysis low self Confidence with Problem Posing learning methods and Expository learning methods presented in table 7 below:

Table 7. The Tukey Test Low Self Confidence with Problem Posing Learning Methods and Expository Learning Methods

SC Low PP	Mean Difference	Std.Error	Sig	Lower Bound	Upper Bound
SC Low Exspository	-8,19	2,996	<0,038	-16,05	-33

According to the Tukey test results in table 7 on the fourth hypothesis, students with low self-confidence are addressed using the Problem Posing learning strategy, whereas the expository learning method has a significant score of 0.038. This suggest, it is less than the 0.05 criterion for determination. H_0 is rejected, meaning that among students with low self-confidence, an average critical thinking skills of the Problem Posing learn strategy is lower than that of the expository learning approach.

Based on the results of data analysis, the critical thinking skills of students who learn to apply Problem Posing methods is higher than students who learn with expository methods. Several prior researchers, have found that using the Problem Posing learning method helps increase students' critical thinking skills (Lestari et al., 2022). Problem posing fosters students to be participated and critical when generating and analyzing issues in order to gain 21st-century skills. When asking questions, students can investigate and analyze information to strengthen their learning abilities (Jamil, Batool Bokhari, et al., 2024). The ability to ask questions will create new ideas, discoveries, and better solutions for problems (Salmon & Barrera, 2021).

Students that are self-confident believe in their capacity to solve problems (Byiringiro, 2024). Student can overcome challenges that have never been encountered before with the best situation, allowing learners to use Problem Posing learning to answer the questions they have asked (Santos et al., 2024). In problem posing, students connect the concept of understanding with the information they are familiar with pupils' abilities to solve issues and evaluate responses to inquiries (Ventistas et al., 2024). Assessing the answer is done to determine the strength or weakness of the arguments presented. Evaluation is a sub-skill of critical thinking used to determine an argument's strength or weakness (Dwyer et al., 2014; Evagorou et al., 2023).

This study discovered a difference in the average critical thinking skills of students with high self-confidence after learning the Problem Posing methods against the Expository method. This occurs because student with high self-confidence are defined by the trait of daring to speak their thoughts. The characteristic of self-confidence is daring to express an opinion, which means the attitude of expressing something that wants to be expressed to others without coercion or a sense that inhibits disclosure (Lauster, 2015; Puspasari & Sutama, 2024). Students dare to design stories to support asking questions. By designing stories in accordance with the problem-solving situation, students with a high sense of trust and self-confidence will dare to express questions smoothly without obstacles Higher degrees of student boldness in problem-posing learning can contribute to enhancing students' critical thinking analysis

because students can recognize the information they gather to construct a story design in asking questions. Furthermore, student with high confidence in maths are more bold in taking problem steps and have more suggestions for problem solving (Hendriana et al., 2018).

In contrast to student with high self-confidence, learning via the expository method does not channel their boldness to ask questions; there are limited opportunities for students to evaluate and explore concepts, and students must solve difficulties (Toheri et al., 2020). Students using the expository technique do not write the steps of completion on a regular basis and make calculating errors because they are unable to accurately assess the issue, thus they must be more specific in writing replies (Shabira et al., 2022).

Another finding of this study is that there is a difference in the average critical thinking skills of students with low self-confidence after studying the Problem Posing methods compared the Expository method. Students with poor mathematics self-confidence are nervous about learning new things, believe every aspect of mathematics is complicated, believe they are fundamentally poor in mathematics and are concerned more about mathematics over about different topics (Galbraith & Haines, 1998; Pokhrel, 2024). Students' lack of self-confidence might lead to uncertainty and suboptimal answers to questions (Rizqi et al., 2021). As therefore, students with poor self-confidence in Problem Posing Learning contribute less to enhance of critical thinking skills. Student with poor self-confidence require a variety of activities to enhance their reasoning skills and comprehension of concepts (Kuncoro et al., 2021). Self-confidence will be sufficient to affect critical thinking skills in terms of comprehending concepts in order to analyze and draw conclusions from problem solving.

Student with low self-confidence will feel at ease when learning utilizing the expository methods because the teacher will always provide exposure and explanation of the material. The expository method puts a teacher in charge of the entire learning process, with learners performing as recipients and listeners to whatever the teacher says Prayekti (2016) resulting in improved critical thinking skills in students with low self-confidence. Self-confidence for a student as an important factor in determining academic success (Esparrago-Kalidas et al., 2023).

Based on the explanation above, it is proven that there is an impact of the Problem Posing learning methods on critical thinking skills in terms of the self-confidence of grade V students of SDN Bojong Nangka 01 and SDN Bojong Nangka 02 in mathematics. The difference in the previous study was the difference in the material, namely the quality and volume of building space.

CONCLUSION

The findings in this study can be concluded that: 1) there is a considerable difference in critical thinking skills among students who use the problem posing method with expository; 2) Mathematics learning using the problem posing method has a significant impact on students' critical thinking skills and confidence; 3) students who use the problem posing method have a higher average critical thinking ability than students who learn using the expository method; 4) Students who use problem posing methods have poorer critical thinking skills on average compared to those who use expository strategies. This research can be applied

in Mathematics learning by paying attention to student confidence so that it has an impact on the critical thinking ability of elementary school students.

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