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The Effect of The PBL Model on Improving Critical Thinking Skills of V Grade Students in IPAS at SDN 122345 Pematangsiantar

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Abstract

This study aims to determine the effect of the Problem Based Learning (PBL) learning model on improving the critical thinking skills of fifth grade students in the science subject at SD Negeri 122345 Pematangsiantar. The research used a quantitative method with a One Group Pretest-Posttest design. The research sample was all 32 fifth-grade students. The research instrument was a descriptive test validated by experts. Data were collected through pretests and posttests, then analyzed using N-gain calculations. The results of the study showed an increase in the average value from 59.59% in the pretest to 94.19% in the posttest with an N-gain value of 0.86 which is included in the high category (≥0.7). This proves that the implementation of the Problem-Based Learning model has a significant impact on improving students' critical thinking skills in science learning. Therefore, PBL can be used as an effective alternative learning strategy to develop critical thinking skills and student engagement in elementary schools.

Keywords: Problem Based Learning, Critical Thinking, Science, Learning.

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Introduction

Education is an effort to improve a person's quality of life, which is directly prepared to support and follow the pace of development of science and technology in an effort to improve the quality of education in line with the teaching and learning process. The teaching and learning process is the main activity of the school in which there is direct interaction between teachers and students in an interactive and educational context, so that there are changes in students, both changes at the cognitive, affective and psychomotor levels. The National Education System states that education plays a vital role in developing the nation's next generation, who are intelligent and reliable in implementing national development. Given the crucial role of education in shaping the nation's next generation, improving the quality of education is a must to keep pace with current developments.

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have spiritual religious strength, self-control, personality, intelligence, noble morals, and the skills needed by oneself, society, nation and state. Seeing the importance of the role of education in shaping the nation's next generation, improving the quality of education is something that must be done continuously in order to keep up with the times.

In keeping with the changing times and the need to improve the quality of Indonesia, the government has decided to change the curriculum to improve the learning process in every school in Indonesia. This shift from the 2013 curriculum to the independent curriculum creates a generation that is ready to face future challenges and is able to compete. The independent curriculum emphasizes

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students' ability to apply Pancasila values and think critically. Specifically, at the elementary school level (SD/MI), the learning process utilizes the PBL learning model.

These learning outcomes can be derived from the assessment process. PBL learning outcomes are the skills students acquire after the learning process has taken place, reflecting their learning experiences, demonstrated by problem-solving, increased knowledge, and critical thinking. Learning outcomes are one of the indicators of the learning process. In this study, the learning outcomes of fifth grade students of SD Negeri 122345 Pematangsiantar were included, which were taken from semester exams, which were still low and had not met the KKM set by the school.

Based on the results of research observations in class V of SD Negeri 122345 Pematangsiantar, it is concluded that from the table above, 19 class V students got scores below the KKM in the subject of Social Sciences with a completion rate of 59% and as many as 13 class V students got scores above the KKM in the subject of Social Sciences with a completion rate of 41%. It can be seen from the data above that the students' scores in the subject of Social Sciences are very low. The low learning outcomes in the presentation of science and science material are due to teachers still tending to use a learning model that is only centered on the teacher and the learning process is very uninteresting. This is a crucial issue for teachers, as inappropriate use of learning models can significantly impact students. Therefore, implementing appropriate models can help students grasp the material more quickly.

Problem-Based Learning (PBL) is learning that occurs through a process of understanding how to resolve a problem. According to Hunamie et al. (2023), Problem-Based Learning is a learning model that involves students in solving real-life problems. PBL is a form of transition from a teaching paradigm to a learning paradigm, so the focus is on student learning and not on teacher instruction. Therefore, researchers are interested in conducting research on the "influence of the Problem Based Learning model on Improving Critical Thinking Skills of Fifth Grade Students in Science Learning at SD Negeri 122345."

In general, the results of this study are expected to theoretically contribute to science learning to improve students' critical thinking skills through the Problem Based Learning model. Finding new theories that can be used to improve students' activeness and thinking skills through the PBL model and as a reference for subsequent research. Specifically, this research is expected to contribute to the science learning strategy and be able to optimize the increase in students' activeness and critical thinking skills through the Problem Based Learning (PBL) model.

Methodology

Basically, this section explains how this research was conducted. The main material of this section is: (1) The influence of the Problem Based Learning Model to improve the critical thinking skills of fifth grade students in the subject of science; (2) population and sample, namely all students at Sd Negeri 122345 with a total of 32 students; (3) data collection techniques using Pretest and Posttest and data processing using quantitative with the N-gain and Aiken formulas (4) and data analysis techniques using a one group posttest design. For research, tools and materials were used, namely student worksheets and teaching materials using image media and animated videos from YouTube.

The type of research used in this study is quantitative research with an experimental method involving one class. The reason for using quantitative research with an experimental method is to determine whether there is an effect after being given treatment. According to Sugiono (2020:72), experimental research is a research method used to find the effect of a treatment on others under controlled conditions.

The type of design used is One Group Pretest-Postest Design, a technique to determine the effects before and after administering an intervention. 1. Background of the problem, namely the lack of students who pass the KKM score. 2. Research Problem Limitations The research is focused on the application of the Problem Based Learning (PBL) model to improve the critical thinking skills of fifth grade students of SD Negeri 123445 on the theme "Let's Get to Know Our Earth".3. Problem Formulation “How is the application of the Problem Based Learning (PBL) learning model to improve the critical thinking skills of fifth grade students in science learning at SD Negeri 123445?” 4. Research Objectives To determine the effect of the application of the PBL model on improving the critical thinking skills of fifth grade students. 5. Theoretical Research Benefits: Adding references to PBL-based science learning to improve creativity and critical thinking.

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Results and Discussion

A learning model is a process pattern used as a guideline in planning learning activities. Learning is a systematic activity. Problem-based learning (PBL), often called problem-based learning, is learning that is centered on students by confronting students with various problems they face in their lives. According to Arens (Trianto 2020:45), the Problem-Based Learning (PBL) model has the following characteristics: Asking questions or problems focuses on interdisciplinary connections. Collaborative problem-based learning is characterized by students working together.

Table 1 Steps in Problem-Based Learning

Stage	Teacher activities	Student activities
Formulating the problem	The teacher guides students to determine the problem to be solved in the learning process, even though the teacher has actually determined the problem	1. Students identify problems 2. Students can solve problems 3. Students can develop their own critical thinking
Analyze the problem	Steps for students to critically review problems from various points of view	Students analyze the problems that occur
Formulating a hypothesis	Steps for students to formulate various possible solutions according to the knowledge they have	Students formulate problems in the hypotheses that will be tested.
Collecting data	Steps for students to find and describe various information needed to solve problems	Students manage the information they have obtained through group discussions.
Hypothesis testing	Students' steps in formulating and drawing conclusions in accordance with the acceptance and rejection of the proposed hypothesis	Students and groups conduct experiments or observations to test the required data.
Formulate problem-solving recommendations	The steps taken by students describe recommendations that can be made according to the formulation of the results of hypothesis testing and the formulation of conclusions.	Students formulate problems and can draw conclusions

Sumber Jhon Dewey (Endayani H, 2023:79)

According to Parameswari (Dores et al., 2020), one factor that can influence the development of critical thinking skills is the interaction between teachers and students. A conducive learning environment can increase student enthusiasm during the learning process, allowing them to concentrate on solving the problems presented.

According to Sisra Elfina and Ike Sylvia (2020), the goal of critical thinking is to test an opinion or idea, to make considerations based on the opinion put forward, and to be accountable.

According to Enis (2020:456), critical thinking is reasoned and reflective, emphasizing decision-making about what to do. Critical thinking can be achieved more easily if a person possesses the skills and abilities that can be considered the traits and characteristics of a critical thinker. According to Eliana et al. (2021:87), there are several benefits of critical thinking for academic performance, namely:

a. Understanding others' arguments and beliefs
b. Critically evaluating those arguments and beliefs
c. Developing and defending well-supported arguments and beliefs.

Sapriya (2020:87) states that the purpose of critical thinking is to examine an opinion or idea, including making judgments or considerations based on the opinion put forward. These judgments are usually supported by accountable criteria.

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Table 2 Critical Thinking Ability Indicators

Aspect	Indicator
1. Problem Clarification	• Able to identify issues or problems accurately • Formulate relevant and in-depth questions
2. Assessing Information	• Distinguishing between facts and opinions • Assessing the validity and relevance of data/information
3.Inferensi	• Draw conclusions based on available evidence • Identify cause and effect
4.Assessment and Evaluation	• Evaluate arguments based on logic and evidence • Detect bias or unfounded assumptions
5. Eksplanasi	• Explain the results of thinking logically and systematically • Convey the reasons or basis for the opinion taken
6. Self-regulation	• Reflect on one's own thought process • Correct logical errors in thinking

The type of research that will be used in this research is quantitative research with an experimental method involving one class. The reason for using quantitative research with experimental methods is to find out whether there is an effect after treatment is given. According to Sugiono (2020:72), experimental research is a research method used to find the effect of treatment on others in controlled conditions.

The type of design used is a One Group Pretest-Postest Design, a technique to determine the effects before and after the administration of the perpetrator. The location of this research will be carried out at the UPTD SD Negeri 122345 Jl. Thamrin, East Siantar District, Pematangsiantar City, North Sumatra Province. This research will be conducted in the odd semester of the 2025/2026 academic year at the UPTD SD Negeri 122345 Pematangsiantar.

Population is a generalization area consisting of objects and subjects that have certain characteristics and traits determined by the researcher to be studied and then conclusions drawn, so the population of this study is all fifth grade students of UPTD SD Negeri 122345 Pematangsiantar, namely 1 class with a total of 32 students.

This study uses quantitative analysis, a technique that involves mathematical calculations, as the data obtained is numerical, specifically from the learning outcome test given to students. Furthermore, the data collected from one class is processed and analyzed to draw conclusions regarding whether or not there are differences in critical thinking skills among students taught using the learning model *Problem based learning*.

The normalized gene test N-gain was conducted to determine the increase in students' critical thinking skills after being given treatment and calculations using SPPS.

$$N_{Gain} = \frac{Skor\ Postest - Skor\ Pretest}{Skor\ Ideal - Skor\ Pretest}$$

This study aims to determine the effect of the Problem Based Learning model to improve critical thinking skills of class V in science learning at SD Negeri 122345 Pematangsiantar.The data collection for this research used a descriptive test which was first tested by one lecturer, namely Mrs. Dr. Lisbet Sihombing, M.Pd and one teacher, namely the homeroom teacher of class V, the validator, who provided an assessment of the descriptive questions through a validation sheet that had been designed.

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This research is a quantitative study and was conducted on August 19-26, 2025. As stated in the research method, the sample in this study was all fifth-grade students, totaling 32 students. The research data were obtained from a pretest and posttest containing 10

Table 3 Validation Results

Butir	Perihal		S1	S2		N(C-1)	V	KETERANGAN
	I	II						
Butir-1	4	4	3	3	6	6	1	Valid
Butir-2	3	4	2	3	5	6	0,833333	Valid
Butir-3	4	4	3	3	$\sum_{6} s$	6	1	Valid
Butir-4	4	4	3	3	6	6	1	Valid
Butir-5	4	4	3	3	6	6	1	Valid
Butir-6	4	4	3	3	6	6	1	Valid
Butir-7	4	3	3	2	5	6	0,833333	Valid
Butir-8	4	4	3	3	6	6	1	Valid
Butir-9	4	3	3	2	5	6	0,833333	Valid
Butir-10	4	4	3	3	6	6	1	Valid

(data processing source from Microsoft Excel)

Based on the results of the instrument test carried out by the validator, it can be seen that the researcher's experimental assessment scale is valid and can be used as an instrument for research.

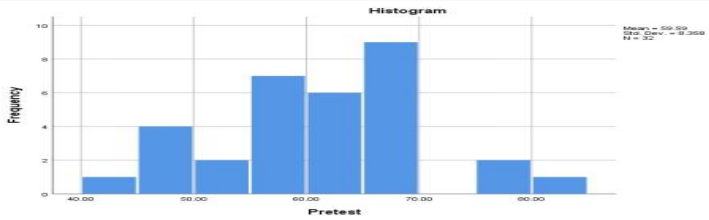
Description of Results Before Pretest Treatment

Below is the data on students' critical thinking abilities in the form of pretest questions, so that the raw score of students' critical thinking abilities is obtained with 10 descriptive questions, before learning is carried out with the aim of knowing students' initial critical thinking abilities in the fifth grade science subject at SD Negeri 122345. The following is the pretest table data.

4 Percentage of Students' Critical Thinking Skills Pretest Scores

No	Interval	Kategpori	Frekuensi	Presentase
1.	30-50	Not Enough	5	15 %
2.	51-70	Enough	24	75 %
3.	71-80	Good	3	10 %

The table shows that fifth-grade students at Pematangsiantar State Elementary School 122345 have relatively low critical thinking skills and need to improve, particularly in the sciences field. This is because 15% of students performed poorly and 75% performed well. The pretest percentage graph of students' critical thinking skills can be presented in the following bar chart.



In the graph above, it can be seen that in class V students of SD Negeri 122345 Pematangsiantar, there are still many students whose critical thinking skills are still low, and there needs to be an improvement in students' critical thinking skills.

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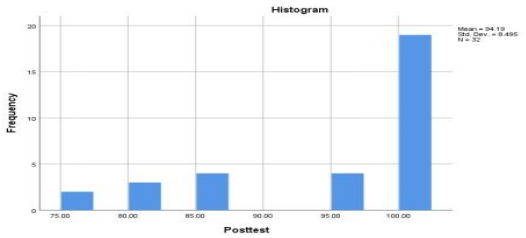
Description of Results After Treatment Posttest Results

After implementing the Problem-Based Learning model, a posttest was conducted to determine students' critical thinking skills. The following table shows the percentage data.

Tabel 5 Presentase Nilai Posttest Kemampuan Berpikir Kritis

No	Interval	Kategori	Frekuensi	Presentase
1.	70-80	Good	2	7%
2.	80-100	Very Good	30	93%

The table shows that 93% of students scored very good in critical thinking skills after implementing the Problem-Based Learning model. This means that students' critical thinking skills improved significantly before and after the implementation of the Problem-Based Learning model. This marks the beginning of improvements in students' critical thinking.



The frequency graph above shows that the posttest scores for critical thinking skills of fifth-grade students at Pematangsiantar State Elementary School 122345 increased by 93%. This is evidenced by the increase in the number of students, which increased by 32.

Based on the calculations, the N-gain test results are obtained as shown in the following table. The results of the pretest and posttest N-gain tests can be presented in SPSS format.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Ngain_Score	32	.29	1.00	.8656	.20473
Ngain_Persen	32	28.57	100.00	86.5576	20.47252
Valid N (listwise)	32				

Descriptives

			Statistic	Std. Error
Pretest	Mean		59.5938	1.47756
	95% Confidence Interval for Mean	Lower Bound	56.5802	
		Upper Bound	62.6073	
	5% Trimmed Mean		59.4028	
	Median		60.0000	
	Variance		69.862	
	Std. Deviation		8.35834	
	Minimum		43.00	
	Maximum		80.00	
	Range		37.00	
	Interquartile Range		10.00	
	Skewness		.337	.414
	Kurtosis		.228	.809
Posttest	Mean		94.1875	1.50164
	95% Confidence Interval for Mean	Lower Bound	91.1249	
		Upper Bound	97.2501	
	5% Trimmed Mean		94.9306	
	Median		100.0000	
	Variance		72.157	

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Std. Deviation	8.49454	
Minimum	75.00	
Maximum	100.00	
Range	25.00	
Interquartile Range	14.50	
Skewness	-1.157	.414
Kurtosis	-.156	.809

Conclusion

Based on the results of research that has been conducted by researchers, namely to determine the effect of the Problem Based Learning model to improve the critical thinking skills of fifth grade students in science learning at SD Negeri 122345 Pematangsiantar, the author draws the following conclusions. That the use of the Problem Based Learning model has a significant effect on students' critical thinking skills to develop thinking and problem-solving skills in fifth grade. This can be seen from the increase in percentage between pretest and posttest scores of 94.19%. There was an increase in students' critical thinking skills using the Problem Based Learning model. This shows that their average post-test score was 94.19%. The results of the class N-gain calculation obtained an average pre-test of 59.59% and an average post-test of 94.19%. So the N-gain obtained was 0.86, meaning that the class experienced an increase in critical thinking skills with a high category because (g) ≥ 0.7. Based on these data, it is said that the increase in the results of critical thinking skills in science material using the Problem Based Learning model is better than before using the Problem Based Learning model. Based on the results of the hypothesis test, it is determined that Ha is accepted and H0 is rejected.

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