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The Effect of a Problem-Based Learning Model Rooted in Local Wisdom on the Critical Thinking Skills of Elementary School Students

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ABSTRACT

Objective: *This study aims to measure the extent of the influence of a Problem-Based Learning model grounded in local wisdom on students' critical thinking skills and to analyze its implications for IPAS teaching practices in elementary schools.* ***Method:*** *The study employed a quantitative approach with a quasi-experimental design involving 57 students from SDN Bendotretek 1, comprising 27 students in the experimental class and 30 students in the control class. Data were collected through pretest and posttest assessments as well as observation sheets on the implementation of the learning process.* ***Results:*** *The results showed that the implementation of local wisdom-based PBL achieved an average of 90.5%, falling into the "very good" category. The N-Gain score for the experimental class was 0.64, while that for the control class was 0.36. The results of the Independent Samples t-Test showed a significance value of 0.015 < 0.05, indicating a significant difference in critical thinking skills between the two groups. Cohen's d value of 0.666 indicates a moderate effect size.* ***Novelty:*** *Thus, Problem Based Learning based on local wisdom has a positive effect on improving students' critical thinking skills.*

INTRODUCTION

Educational institutions play a vital role in developing 21st-century competencies, particularly critical thinking skills. This role is crucial because individuals are expected to master a variety of competencies in order to adapt to and face the increasingly complex challenges of real life. Critical thinking is the process of gathering, analyzing, and understanding information using reflective attitudes and skills, with the goal of helping people think, analyze, and act in a logical manner[1]. Critical thinking skills help create meaningful learning experiences for students and emphasize their active involvement in every stage of the learning process, thereby contributing to the achievement of educational goals.[2]. Through critical thinking, students can gain a deeper understanding of concepts rather than simply memorizing information. This skill also supports problem-solving in everyday life [4]. Critical thinking is the skill of using reason to analyze, understand, distinguish, evaluate, and develop information or ideas derived from observation and experience as a basis for determining the appropriate course of action[5][6]. Critical thinking skills involve the ability to apply logic and a systematic approach to problem-solving, analyze and process information based on facts, draw conclusions, and make logical decisions and arguments[7]. Critical thinking is an important skill that requires ongoing development throughout the learning process. This skill can be cultivated through active learning that encourages students to analyze, process, and evaluate information. Through these activities, students are expected to be

able to solve problems and make sound decisions.[8][9]. Because critical thinking is the process of examining something in depth and with careful consideration to determine what is credible and what actions should be taken [10]. In school, critical thinking needs to be taught and cultivated starting in elementary school because the demands of the times require students to be able to think critically in various situations, including when solving problems[11]. Through the Merdeka Curriculum, the IPAS subject integrates science and social studies using a deep understanding-based learning approach in an effort to optimize students' critical thinking skills[12].

The critical thinking skills fostered in the IPAS curriculum for elementary schools are highly beneficial. The goal is to gather information, understand, and analyze the conditions of the students' surrounding environment. Although IPAS instruction offers significant opportunities to foster critical thinking skills, its implementation in elementary schools has not yet been fully optimized. The findings by Fitriyanti et al. also indicate that critical thinking skills among elementary school students remain at a fairly low level [13]. Research findings on public elementary school students in Blitar City show that approximately 60% of students fall into the low critical thinking category, only about 10% reach the intermediate category, and the rest fall into other categories. These findings indicate that the implementation of IPAS instruction has not yet been optimal in improving students' critical thinking skills. Ovita, Perdana, et al. found that IPAS instruction has not been sufficiently effective in helping students hone their critical thinking skills. This finding is supported by Dewi, A. S., et al. (2023), who reported that 42% of students fell into the low category, while 35% fell into the adequate category[14]. This is supported by the results of preliminary observations at SDN Bendotretek 1, which indicate that students' critical thinking skills in IPAS lessons have not shown significant development. As a result, students tend to participate less actively and provide brief answers that do not require much reasoning when the teacher asks questions. Current teaching practices still tend to be dominated by the use of teacher-centered lecture methods. Therefore, there is a need for a learning model centered on contextual problem-solving that can enhance students' active participation in IPAS learning activities.

The Problem-Based Learning model is a learning approach centered on student activities, with students as the primary agents in the learning process and educators serving as facilitators who provide guidance and support throughout the learning process by using real-world problems as the primary context. Problem-Based Learning is a student-centered learning approach that engages students in solving real-world problems. Rooted in constructivist principles, Problem-Based Learning encourages students to shape their own learning by applying their knowledge and skills to solve real-world problems. They do this by collaborating with their peers and receiving guidance from their teachers[15][16]. This model helps students improve their critical thinking skills in an active and creative way. The problem-based learning model presents contextual situations or cases that actively engage students in finding solutions, while also developing their critical thinking skills, building and understanding knowledge, and enabling them to explain concepts in their own words. Through the implementation of

problem-based learning, students are encouraged to take a more active role in the learning process and gain real-world, meaningful learning experiences [17]. The syntax of Problem-Based Learning includes problem orientation, organizing learning, investigation, presenting results, and evaluating problem-solving [18]. The implementation of Problem-Based Learning in the Merdeka Curriculum requires problem-based instructional design linked to real-world contexts so that the knowledge gained is more meaningful. Learning based on local wisdom which encompasses the values, knowledge, skills, norms, and customs of the community can strengthen the implementation of Problem-Based Learning because it is closely tied to students' experiences[19]. Integrating local wisdom into the learning process enriches the context of students' learning and fosters a sense of ownership over what they learn [20]. Local wisdom is a body of knowledge, customs, and practices passed down from one generation to the next; through culture-based learning, it helps students understand their own culture while instilling values that serve as guidelines for interacting with their surrounding environment[21]. Based on this explanation, it can be concluded that the Problem-Based Learning model is consistent with the Merdeka Curriculum, which emphasizes the use of real-world problems as the center of contextual learning and as the primary foundation for the learning process. This approach not only contributes to the development of students' critical thinking skills but also helps them connect academic concepts to the realities of everyday life. Furthermore, integrating problem-based learning with local wisdom makes the learning process more relevant to real-life contexts and provides students with a deeper sense of meaning.

A number of empirical studies indicate that the implementation of a problem-based learning model has a significant impact on improving the critical thinking skills of elementary school students. Research by Vionita Lestari et al. on fourth-grade students at SD Negeri 10 Talang Kelapa showed that a problem-based learning model rooted in local wisdom resulted in an average score of 88.1 in the experimental class, which was higher than that of the control class 83.1. Similar results were reported by Hardiantiningsih at SDN 37 Ampenan, Mataram City, with an average critical thinking skills score of 82.95 and a significant difference between the experimental and control classes[22]. Most previous studies have not specifically addressed the application of Problem-Based Learning grounded in local wisdom in IPAS instruction under the Merdeka Curriculum, nor have they measured critical thinking using structured indicators. This study highlights its novelty through the implementation of a Problem-Based Learning model grounded in local wisdom that is contextualized within students' everyday lives, and is accompanied by structured assessments of critical thinking skills. The Problem-Based Learning model, integrated with elements of local wisdom, is closely linked to the development of students' critical thinking skills[23][24]. Students are encouraged to identify real-world problems, analyze information, evaluate various solutions, and draw logical conclusions through the presentation of contextual problems rooted in local wisdom[25][26]. The stages of problem-based learning are designed to develop students' analytical skills, logical reasoning, and systematic decision-making in

order to foster their critical thinking skills. Thus, integrating problem-based learning with local wisdom can serve as an effective teaching strategy[27]. IPAS learning requires strengthening the connection between concepts and real-world problems, as well as critical thinking skills. Problem-Based Learning grounded in local wisdom is relevant because it presents contextual problems to students. However, structured studies on its application in IPAS remain limited. This study aims to measure the extent of the impact of a Problem-Based Learning model grounded in local wisdom on students' critical thinking skills, as well as to analyze its implications for IPAS teaching practices in elementary schools.

RESEARCH METHOD

This study employs a quantitative approach using a quasi-experimental method, specifically a nonequivalent control group design. In this design, the study involves two groups of subjects: an experimental group and a control group. The choice of a quantitative approach was based on the research objective of testing hypotheses through the collection of data obtained using specific research instruments, which were then analyzed statistically to arrive at objective and scientifically sound conclusions[28]; [29]. A quasi-experimental design was used because the subject groups had formed naturally, making it impossible to fully randomize the subjects [30]. All fifth-grade students at SDN Bendotretek 1 were included as subjects in this study. The sampling technique used was total sampling, in which the entire population was included in the study. This was done because there were only two fifth-grade classes at the school, As a result, the entire class was included in the study. One group was designated as the experimental class, which received instruction using a Problem-Based Learning model grounded in local wisdom, while the other group served as the control class and followed conventional instruction.

The research instruments used included an observation sheet to measure the implementation of Problem-Based Learning during instruction, as well as an essay-style test to measure students' critical thinking skills. The essay test was chosen because it is able to assess students' ability to present reasons, analyze problems, draw conclusions, and develop in-depth problem-solving strategies. The test instruments were designed based on the indicators of critical thinking skills proposed by Ennis, which include (1) providing a simple explanation, (2) building basic skills, (3) drawing conclusions, (4) providing an advanced explanation, and (5) formulating strategies and tactic. The Problem-Based Learning framework includes problem orientation, learning organization, investigation, presentation of results, and evaluation of problem-solving. Before being used in the study, the test instruments were first validated through a content validity procedure. [31][32].

Data collection for this study was conducted during the learning activities. Data on the implementation of the Problem-Based Learning model were obtained through observation. Data on students' critical thinking skills were collected using an essay-based test. Next, the data on the implementation of instruction were analyzed descriptively to provide an overview of the implementation of the instructional model that was applied.

The critical thinking skills data were then analyzed quantitatively after first conducting prerequisite tests, which included tests of normality and homogeneity. After the data were found to meet the assumptions of normality and homogeneity, hypothesis testing was conducted using an independent samples t-test with the aid of SPSS software. In addition to hypothesis testing, an effect size analysis was also conducted to determine the extent of the impact of implementing the Problem-Based Learning model on students' critical thinking skills.

RESULTS AND DISCUSSION

Results

This research was conducted on May 19–22, 2026, at SDN Bendotretek 1. The study involved two groups: Class VA, the experimental group with 27 students, and Class VB, the control group with 30 students. The implementation of the Problem-Based Learning model based on local wisdom was observed using an observation sheet in the experimental class. Data on the implementation of the model are presented in Table 1.

Table 1. Implementation of the PBL Model based on local wisdom

Meeting	Implementation Score	Implementation Category
I	86%	Very Good
II	95%	Very Good
Average	90,5%	Very Good

Based on Table 1, the average percentage of implementation of the learning model reached 90.5%, which is classified as very good. This indicates that all stages of the Problem-Based Learning syntax based on local wisdom from contextual problem orientation to the evaluation of the problem-solving process were successfully implemented consistently and optimally in the experimental class. In the first session, students still need time to adjust to a learning model that positions them as active participants in the problem-solving process. Activities such as identifying problems, gathering information, discussing, and presenting the results of their investigations are not yet fully carried out independently. In the second session, student engagement was noticeably better. The students began to get used to following the flow of the lesson and showed more active participation in group activities.

One activity that provides a hands-on learning experience is an investigation of traditional foods in the school community. Students conduct observations and interviews with vendors of traditional foods to gather information about the types of foods, the ingredients used, and the cultural significance associated with them. This activity provides students with the opportunity to obtain information from authentic sources and then relate it to the issues being studied. This demonstrates that incorporating local wisdom into the learning context can provide students with opportunities to learn through experiences that are relevant to their daily lives. An N-Gain analysis was conducted to determine changes in students' critical thinking skills based on a

comparison of pretest and posttest scores [33]. The results of the analysis for both groups are presented in Table 2.

Table 2. N-Gain results of experimental and control classes

Class	Pretest Mean	Posttest Mean	Mean N-Gain	N-Gain (%)	N-Gain Category	Effectiveness Interpretation
Experimental	60,26	86,11	0,64	63,53%	Moderate	Fairly Effective
Control	68,13	81,23	0,36	36,04 %	Low	Not Effective

Based on Table 2, the average critical thinking skills of the experimental group increased from 60.26 on the pretest to 86.11 on the posttest. An N-Gain value of 0.64, or 63.53%, indicates a moderate improvement. Meanwhile, the control group showed an average increase from 68.13 to 81.23, with an N-Gain of 0.36, or 36.04%, which falls into the low category[34]. The findings indicate that although the experimental group's average initial ability was lower than that of the control group, the experimental group's post-instruction achievement was actually higher. The average difference in score improvement also showed a stronger trend in the experimental group. These N-Gain results provide a descriptive picture that Problem-Based Learning grounded in local wisdom yields a greater improvement in critical thinking skills compared to the control group's learning.

A normality test was conducted prior to hypothesis testing to ensure that the data met the assumption of a normal distribution. Since the number of students in each group was less than 50, the Shapiro-Wilk test was used to assess normality. The test results are presented in Table 3.

Table 3. Results of the normality test using the Shapiro-Wilk test

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Hasil	Statistic	df	Sig.	Statistic	df	Sig.
Kelas	Pretest A (Kontrol)	.124	30	.200*	.939	30	.087
	Postets A (Kontrol)	.099	30	.200*	.987	30	.966
	Pretest B (Experimen)	.103	27	.200*	.948	27	.196
	Postets B (Experimen)	.145	27	.151	.951	27	.227

Based on Table 3, all significance values are above 0.05. The significance values for the pretest and posttest in the control group were 0.087 and 0.966, respectively, while those in the experimental group were 0.196 and 0.227. Thus, all data are considered to be normally distributed, thereby satisfying one of the assumptions for the use of parametric statistical analysis.

A homogeneity test was conducted to determine whether the variances of the data in the experimental and control groups were similar. The test was performed using Levene's test.

Table 4. Results of the homogeneity test using Levene's test.

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Kelas	Based on Mean	1.113	1	55	.296
	Based on Median	1.233	1	55	.272
	Based on Median and with adjusted df	1.233	1	54.987	.272
	Based on trimmed mean	1.157	1	55	.287

Based on the Test of Homogeneity of Variance table, the homogeneity test was conducted using Levene's Test. In the "Based on Mean" row, the Levene statistic was 1.113 with a p-value of 0.296. Since the p-value of 0.296 is greater than 0.05, H_0 is accepted; therefore, it can be concluded that the variances of the data in both classes are homogeneous.

After the requirements for normality and homogeneity were met, the analysis continued with an Independent Samples t-Test to determine whether there was a difference in critical thinking skills between the experimental group and the control group.

Table 5. Results of the Independent Samples t-Test.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
nilai	Equal variances assumed	1.113	.296	-2.510	55	.015	-4.878	1.943	-8.773	-.983
	Equal variances not assumed			-2.536	54.571	.014	-4.878	1.923	-8.733	-1.023

The results of the analysis show a t-value of -2.510, degrees of freedom (df) = 55, and a significance level of 0.015. Since 0.015 < 0.05, H_0 is rejected and H_1 is accepted. Thus, there is a significant difference in critical thinking skills between the experimental group and the control group. The Mean Difference value of -4.878 indicates an average difference of 4.878 points between the two groups. The negative sign indicates the direction of the difference based on the order of the groups in the SPSS data analysis. Based on the posttest averages, the experimental group scored 86.11, while the control group scored 81.23; thus, the experimental group's achievement was 4.88 points higher. These results reinforce the previous N-Gain findings. While N-Gain indicated that the experimental group's improvement was descriptively higher, the t-test showed that this difference in achievement was statistically significant.

Significance tests do not indicate the magnitude of the treatment effect. Therefore, this study includes an effect size analysis using Cohen's d.

Table 6. Results of the Effect Size Analysis

Independent Samples Effect Sizes

		Standardizer[a]	Point Estimate	95% Confidence Interval	
				Lower	Upper
nilai	Cohen's d	7.326	-.666	-1.197	-.128
	Hedges' correction	7.428	-.657	-1.181	-.127
	Glass's delta	6.542	-.746	-1.297	-.182

The results of the analysis show a Cohen's d value of -0.666. To determine the effect size category, this value is assessed based on its absolute value 0.666 which places it in the moderate category. The Hedges' correction value of -0.657 and Glass's delta value of -0.746 also indicate that the effect size falls within the moderate category[35]. These findings indicate that the difference in critical thinking skills between the two groups is not only statistically significant but also has an effect size that is quite meaningful in practical terms. The study does not show that PBL based on local wisdom absolutely produces a very large effect, but it does provide evidence that this model yields a difference that is quite significant compared to learning in the control group. The effect size, which falls into the moderate category, may be influenced by several factors. The model was implemented over a relatively limited study period, so students did not yet have extensive experience with problem-based learning. In addition, students' initial abilities, group work skills, ability to ask questions, and ability to process information obtained from their investigations may also have influenced their final outcomes. Nevertheless, these results still demonstrate significant potential for IPAS learning. Research on Problem-Based Learning among elementary school students shows a consistent trend toward improving critical thinking skills.

Discussion

The results of the study indicate a significant difference in critical thinking skills between students who received PBL instruction based on local wisdom and those in the control group. These findings are supported by three complementary analyses. First, the experimental group achieved an N-Gain of 0.64, higher than the control group's 0.36. Second, the results of the Independent Samples t-Test showed a p-value of $0.015 < 0.05$, proving a significant difference between the groups. Third, Cohen's d of 0.666 indicates a moderate effect size. The combination of these three findings indicates that Problem-Based Learning rooted in local wisdom not only produces descriptive changes in scores but is also associated with statistically significant differences in achievement. This can be explained by the nature of Problem-Based Learning, which positions problems as the starting point of learning. Students do not immediately receive solutions from the teacher but are guided to understand the problem, identify the necessary information, conduct an investigation, discuss the results, and formulate a solution based on the information obtained.

In this study, this process was reinforced through the use of traditional foods as part of the context of local wisdom. Students were exposed to objects closely related to their daily lives, making the learning issues more concrete. Interviews with traditional food vendors provided students with the opportunity to obtain information firsthand, ask questions, compare information, and connect their findings to the issues being studied. These activities substantively provide space for the emergence of processes of analysis, evaluation, and drawing conclusions. The findings of this study are consistent with the results of other studies[36] from the perspective of utilizing learning experiences that are directly connected to local wisdom. Thus, the contribution of this study lies not merely in the application of PBL, but in the integration of PBL with the context of local wisdom that students experience firsthand. Issues related to traditional foods are not presented merely as illustrations in textbooks or written questions, but are explored through observation and interviews. This context enables students to connect the knowledge they learn with real-world experiences, thereby making the learning process more meaningful.

The research findings suggest that IPAS learning can be developed through problems rooted in students' social, cultural, and daily-life environments. The use of local wisdom allows teachers to present learning materials that are more closely aligned with students' experiences, ensuring that the concepts studied go beyond mere theoretical understanding. In practice, teachers can develop IPAS problems based on the potential found in the school's surrounding environment, such as traditional foods, community economic activities, environmental management, natural resources, or social and cultural changes. These problems can then be developed following the PBL stages, starting from problem orientation, student organization, investigation, presentation of results, to evaluation of the problem-solving process. Another implication relates to the role of teachers. The implementation of PBL based on local wisdom requires teachers to function not only as conveyors of information but also as facilitators who help students discover and process information. Teachers need to design problems that are closely related to students' lives but still possess a level of complexity that encourages the processes of analysis and evaluation.

The use of local contexts can also broaden the meaning of IPAS learning. Students not only develop critical thinking skills but also gain the opportunity to recognize their environment, understand cultural values, and see the potential that exists in their region. Research on PBL based on local wisdom shows that this approach can link the process of developing critical thinking with contextual learning experiences [37]. Thus, the results of this study indicate that Problem-Based Learning grounded in local wisdom can be used as an alternative approach to teaching IPAS to support the development of critical thinking skills among elementary school students. Its strength lies in the model's ability to integrate problem-solving processes with learning experiences drawn from the students' own environments.

CONCLUSION

Fundamental Finding : The implementation of the Problem-Based Learning model grounded in local wisdom achieved an average implementation score of 90.5%, categorized as very good. The experimental group demonstrated greater improvement in critical thinking skills, with an N-Gain score of 0.64 compared to 0.36 in the control group. The Independent Samples t-Test confirmed a significant difference between the two groups ($p = 0.015$), while Cohen's d of 0.666 indicated a moderate effect size. **Implication :** Problem-Based Learning grounded in local wisdom can serve as an alternative approach to IPAS instruction in elementary schools. Teachers can integrate problems related to traditional foods, community economic activities, environmental management, natural resources, and social or cultural changes into classroom learning. This approach encourages students to investigate real-world issues, analyze information, evaluate solutions, and connect academic concepts with their surrounding environment. **Limitation :** This study involved only 57 fifth-grade students from two classes at SDN Bendotretek 1, limiting the scope of its findings to a single school context. The quasi-experimental design used naturally formed groups without full randomization. Furthermore, the intervention was conducted over a relatively limited period, which may have restricted students' opportunities to develop extensive experience with problem-based learning. Differences in students' initial abilities, group work skills, questioning abilities, and information-processing skills may also have influenced the learning outcomes. **Future Research :** Future research could involve larger samples from different schools and geographical contexts to examine the generalizability of the findings. Further studies could extend the implementation period to investigate the long-term effects of local wisdom-based Problem-Based Learning on critical thinking skills. Researchers may also explore other local wisdom contexts beyond traditional foods and examine how students' initial abilities, collaboration skills, questioning abilities, and information-processing skills influence learning outcomes.

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