Sosioedukasi
JURNAL ILMIAH ILMU PENDIDIKAN DAN SOSIAL
ISSN: 2086-6135 E-ISSN: 2541-612x
Volume 15 No. 2. Juni 2026 https://ejournal.unibabwi.ac.id/index.php/sosioedukasi/index

THE EFFECT OF PROBLEM-BASED LEARNING ON STUDENTS' CRITICAL THINKING SKILLS IN IPAS LEARNING ON CURRENCY VALUE TOPIC

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ARTICLE HISTORY
Received : 20-01-2026
Revised : 07-02-2026
Accepted : 15-05-2026

KEYWORDS
Problem-Based Learning;
Critical Thinking Skills;
IPAS Learning;
Currency Value;
Elementary Education;

ABSTRACT
This study was conducted in response to the low critical thinking skills of fourth-grade students in Integrated Science and Social Studies (IPAS), which were reflected in low learning engagement and achievement scores below the minimum mastery criteria. This study aimed to determine the effect of implementing the Problem-Based Learning model on the critical thinking skills of fourth-grade students in IPAS learning on currency value at SDN Patereman 1. This study employed a quantitative approach using an experimental method with a one-group pretest-posttest design. The research subjects consisted of 29 students selected using a saturated sampling technique. Data were gathered through observation and test instruments, and analyzed using normality testing, paired sample t-test, and N-Gain analysis. The results showed an improvement in students' critical thinking skills, indicated by an increase in the mean score from 48.45 in the pretest to 72.24 in the posttest. The hypothesis testing results showed a significance value of ($p < 0.001$) < 0.05, indicating a significant difference before and after the treatment. Furthermore, the N-Gain score of 0.5764 falls within the moderate category, showing a reasonable level of improvement. Overall, the results indicate that the Problem-Based Learning model has a significant effect on improving students' critical thinking skills and can be effectively applied in elementary-level IPAS learning.

INTRODUCTION

The rapid development of technology, information, and communication in the 21st century has significantly transformed the field of education. Twenty-first century learning is designed to prepare students to adapt to increasingly complex global changes. Learning is no longer solely focused on the acquisition of knowledge, but also emphasizes the development of skills relevant to real-life contexts. In this context, students are expected to develop a

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set of 21st-century competencies commonly referred to as the 6C skills, which encompass critical thinking, creativity, collaboration, communication, character, and citizenship (Astuti, 2024). These competencies play a crucial role in preparing students to think critically, address problems effectively, and engage actively in social life.

One of the 21st-century skills that is a major focus in elementary school learning is critical thinking. Critical thinking skills are necessary so that students are able to analyze problems, evaluate information, and make decisions logically and rationally when facing various everyday life situations. This ability needs to be developed from the elementary school level because it is directly related to higher-order thinking skills that support meaningful learning processes for students, and is influenced by the teaching models and strategies applied by teachers (Tati, 2024).

In the context of 21st-century education, critical thinking represents a crucial competency that students are required to develop. Critical thinking is not merely about understanding information, but also involves the ability to identify the core of a problem, examine the validity of assumptions, analyze cause-and-effect relationships, and evaluate the reliability of opinions or arguments (Supriana et al., 2023). This process also includes interpreting information, drawing logical conclusions, constructing strong reasoning, and critically examining ideas in depth. Critical thinking skills play a vital role in enabling students to process information, construct understanding, and develop into thoughtful, responsible, and ethical individuals (Amalia et al., 2024). Therefore, the development of these skills needs to be systematically integrated into the learning process in Indonesia.

From a conceptual perspective, critical thinking extends beyond mere comprehension of information and involves in-depth processes of analysis and evaluation. Critical thinking includes the ability to identify the core of a problem, examine the validity of assumptions, analyze cause-and-effect relationships, and evaluate the reliability of arguments (Supriana et al., 2023). In addition, this ability also involves interpreting information, drawing logical conclusions, constructing strong reasoning, and critically examining ideas in a comprehensive manner. Critical thinking skills are reflected in several indicators, including elementary clarification, basic support, inference, advanced clarification, and the use of strategies and tactics (Ennis, 2011). These indicators, introduced by Ennis, were adopted as a framework for constructing the research instruments. Therefore, integrating critical thinking skills into the learning process in a systematic manner is essential.

The importance of fostering students' critical thinking skills is further highlighted by the results of the Programme for International Student Assessment (PISA) 2022, released in 2023. The findings reveal that Indonesian students' performance in mathematics (numeracy) is still below the OECD average, with a score of 366 compared to 472 (OECD, 2023). This gap indicates that many students continue to struggle with understanding mathematical concepts and applying them to real-life problem-solving situations (Alfaruqi & Nurwahidah, 2025). These conditions suggest that higher-order thinking skills, particularly critical and analytical thinking, have not been fully developed. Consequently, there is a need for learning approaches that actively engage students in analyzing and solving contextual problems.

One of the efforts that can be made to develop critical thinking skills is through learning in elementary schools, particularly in the Integrated Science and Social Studies (IPAS) subject. One of the important topics in fourth-grade IPAS learning is currency value and students' ability to analyze the authenticity of money in daily life. In the context of IPAS learning, critical thinking skills are essential because learning does not only emphasize conceptual understanding, but also students' ability to analyze problems and make logical decisions through higher-order thinking processes. However, in practice, learning remains largely teacher-centered, which limits students' opportunities to optimally develop their critical thinking skills (Arieshandy et al., 2025).

This condition was also found among fourth-grade students at SDN Patereman 1, Modung District, Bangkalan Regency. Based on classroom observations and interviews with the fourth-grade homeroom teacher, it was found that most students still experienced difficulties when faced with questions requiring reasoning and higher-order thinking skills, particularly essay-type and contextual problems. In addition, students tended to be passive during the learning process, showing a lack of confidence in asking questions, expressing opinions, and providing alternative answers, resulting in limited active participation in discussions and problem-solving activities. These findings were supported by the results of daily IPAS assessments, which showed that 18 out of 29 students (62.07%) scored below the

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Minimum Learning Mastery Criteria (KKTP). This indicates the need to improve instructional quality in order to better support the development of higher-order thinking abilities among students.

The limited development of students' critical thinking skills and their low level of participation may be influenced by the use of learning approaches that remain teacher-centered and conventional. Approaches that do not prioritize problem-solving activities or active student engagement can restrict the growth of critical thinking abilities. In the context of 21st-century education, students are expected to take a more active role in constructing their own knowledge, while teachers function primarily as facilitators. However, this condition has not been fully realized in classroom practice. This is due to the use of less innovative learning models that are not oriented toward student engagement, thereby inhibiting the development of students' critical thinking skills (Manik, 2025).

To address these challenges, the use of an innovative instructional approach such as Problem-Based Learning (PBL) can be considered. This model positions students as active participants by introducing real-world problems as the starting point of the learning process (Hutagalung et al., 2023). Through this approach, PBL is designed to foster deeper understanding, encourage the application of knowledge in contextual problem-solving situations, and support the development of 21st-century skills, including critical thinking, collaboration, and problem-solving (Nurkhotimah & Barokah, 2025).

In practice, students are actively engaged in the learning process by asking questions, gathering information, analyzing data, and evaluating possible solutions both individually and in groups. Problem-Based Learning (PBL) supports the creation of an active learning environment through structured problem-solving activities (Syamsinar et al., 2023). Furthermore, direct involvement in addressing real-life problems enables students to develop a deeper understanding of concepts while also increasing their learning motivation (Wulandari & Arta, 2024). For this reason, PBL is considered a suitable instructional model for primary education, particularly in fostering students' critical thinking skills.

A number of prior studies indicate that the use of Problem-Based Learning contributes positively to the development of students' critical thinking skills. This model encourages students to actively engage in problem-solving processes so that their critical thinking skills can develop optimally. Students taught using the PBL model demonstrate higher critical thinking abilities compared to those who receive conventional instruction (Awami et al., 2022). This suggests that PBL facilitates more meaningful learning by actively involving students in the learning process.

Although previous studies have widely reported the effectiveness of Problem-Based Learning in improving students' critical thinking skills, research focusing on its implementation in Integrated Science and Social Studies (IPAS) at the elementary school level, particularly on the topic of currency value and money authenticity, is still relatively limited. Therefore, further research is needed to examine how the implementation of the Problem-Based Learning model affects students' critical thinking skills in a more contextual learning environment that is in accordance with the characteristics of elementary school students. Based on the problems described above, this study aims to determine the effect of the Problem-Based Learning model on students' critical thinking skills in IPAS learning, especially on the topic of currency value.

METHOD

This research adopted a quantitative approach with an experimental method. The study utilized a pre-experimental design, specifically the one-group pretest-posttest format. This design was chosen due to the absence of a control group and randomization, which aligns with the conditions at SDN Patereman 1, where no parallel classes are available at the fourth-grade level. The research design is presented in Table 1.

Table 1. Research Design: One-Group Pretest-Posttest

Pretest	Treatment	Posttest
O_1	X	O_2

Source: (Sugiyono, 2022)

Notes:
O_1 : Pretest

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X : Problem Based Learning treatment
O_2 : Posttest

The study was conducted at SDN Patereman 1, Modung District, Bangkalan Regency. The population of this study consisted of all fourth-grade students at SDN Patereman 1, totaling 29 students. A saturated sampling technique was applied, in which all members of the population were included as the research sample due to the relatively small number of participants (Sugiyono, 2017). The selection of research subjects was adjusted to the classroom conditions and the research design applied.

The study collected data through classroom observations and written assessments. Observations were conducted to examine how the PBL stages were implemented by the teacher as well as to capture students' participation during the learning activities. In addition, a written test consisting of five open-ended questions was administered to evaluate students' critical thinking skills based on Ennis' framework, which includes elementary clarification, basic support, inference, advanced clarification, and strategy and tactics.

Prior to use, the instruments were reviewed and validated by an expert through lecturer judgment. The validity of each item was determined using the Product Moment correlation, with the requirement that the obtained correlation coefficient exceeded the critical value at a 0.05 significance level. Reliability was then assessed using Cronbach's Alpha, with a minimum acceptable coefficient of 0.60 (Siregar, 2013). Furthermore, the test items were also analyzed in terms of their level of difficulty and discrimination index, both of which met the established criteria.

The data were analyzed using a quantitative approach with the assistance of SPSS version 23. The analysis process began with testing the normality of the data using the Shapiro-Wilk method as a prerequisite for further statistical analysis. Subsequently, hypothesis testing was performed using a paired sample t-test with a significance level of 0.05 (Yuliana, 2021). To examine the extent of improvement in students' critical thinking skills, the N-Gain Score was also calculated. The classification criteria for interpreting the N-Gain results are presented in Table 2.

Table 2. N-Gain Score Criteria

Score Range	Category
$g > 0{,}70$	High
$0{,}30 \leq g \leq 0{,}70$	Medium
$g < 0{,}30$	Low

Source: (Hake, 1999)

Observation data related to teacher and student activities were analyzed by calculating the percentage of implementation and then classified according to the criteria shown in Table 3.

Table 3. Learning Implementation Criteria

Percentage	Category
81% – 100%	Very Good
61% - 80%	Good
41% – 60%	Fair
21% - 40%	Poor
0% – 20%	Very Poor

Source: (Arikunto, 2010)

RESULT AND DISCUSSION

This section presents the findings of the study, focusing on examining the impact of the Problem-Based Learning (PBL) model on fourth-grade students' critical thinking skills. The analysis was carried out in several stages, beginning with a description of the pretest and posttest results, followed by a normality test as a prerequisite for further analysis. Next, a paired sample t-test was employed to determine the significance of the differences between the pretest and posttest scores. To further assess the extent of students' improvement, the N-Gain Score was calculated. In addition, observation data on teacher and student activities were included to support the findings by providing an overview of how the learning process was implemented. The descriptive statistics of students' critical thinking scores are summarized in Table 4.

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Table 4. Descriptive Statistics of Pretest and Posttest Scores on Critical Thinking Skills

Descriptive Statistics	Pretest	Posttest
Number of Students	29	29
Total Score	1405	2095
Mean Score	48,45	72,24
Maximum Score	70	90
Minimum Score	35	60
Students Achieving Mastery	6	21
Students Not Achieving Mastery	23	8

Based on Table 4, students' critical thinking skills prior to the implementation of the PBL model were still relatively low, as indicated by a mean pretest score of 48.45 with a total score of 1405. The maximum score obtained was 70, while the minimum score was 35. Out of 29 students, only 6 students achieved mastery, whereas 23 students did not meet the Minimum Mastery Criteria. After the implementation of the PBL model, the posttest results showed an improvement in students' critical thinking skills, with the mean score increasing to 72.24 and the total score rising to 2095. The maximum score increased to 90 and the minimum score to 60. In addition, the number of students achieving mastery increased to 21, while 8 students still did not meet the Minimum Mastery Criteria. These findings suggest that the implementation of the PBL model played a role in enhancing students' critical thinking skills.

Following the descriptive analysis, a normality test was carried out as an initial step before further statistical procedures. This test was intended to examine whether the distribution of the data met the assumption of normality. The analysis was performed using the Shapiro-Wilk method with the support of SPSS version 23. The outcome of this test served as the basis for selecting the appropriate statistical technique, where normally distributed data were analyzed using parametric methods, while non-normally distributed data required nonparametric approaches. The analysis involved both pretest and posttest scores, and the results of the normality test are summarized in Table 5.

Table 5. Normality Test Results of Pretest and Posttest Data

Data	Significance Level	*p*-value	Decision
Pretest	0,05	0,168	Normal
Posttest	0,05	0,065	Normal

As presented in Table 5, the significance values for the pretest and posttest were recorded at 0.168 and 0.065, respectively. Since both values are above the 0.05 threshold, the null hypothesis (H_0) is accepted while the alternative hypothesis (H_a) is rejected. This indicates that the distribution of both pretest and posttest data related to students' critical thinking skills follows a normal pattern. Based on this result, it can be concluded that the data satisfy the normality assumption, which makes them appropriate for further analysis using parametric statistical techniques.

Following the confirmation of normal data distribution, hypothesis testing was performed using a paired sample t-test. The analysis was intended to examine whether there was a statistically significant difference in students' critical thinking scores before and after the implementation of the PBL model. The outcomes of the paired sample t-test are summarized in Table 6.

Table 6. Hypothesis Testing Results Using Paired Sample t-test

Data	Mean	t	df	*p*-value
Pretest-Posttest	-15.517	-11.352	28	< 0,001

As shown in Table 6, the paired sample t-test produced a *p*-value of less than < 0,001, which is below the 0.05 threshold. This indicates that the null hypothesis (H_0) is rejected while the alternative hypothesis (H_a) is accepted, meaning that a statistically significant difference exists between students' pretest and posttest scores in critical thinking skills. These findings suggest that the implementation of the Problem-Based Learning model had a meaningful effect on improving fourth-grade students' critical thinking abilities in Integrated Science and Social Studies (IPAS), particularly on the topic of currency value.

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To examine the extent of improvement in students' critical thinking skills following the implementation of the PBL model, an analysis using the N-Gain score was carried out. The results of the overall N-Gain calculation based on pretest and posttest data are presented in Table 7.

Table 7. N-Gain Score Results

	N	Minimum	Maximum	Mean	Std. Deviation
N-Gain_Score	29	0.14	1.00	0.5764	0.18432
N-Gain_Persen	29	14.29	100.00	57.6361	18.43187
Valid N (listwise)	29				

Referring to Table 7, the N-Gain analysis reveals that the average score obtained is 0.5764, which is classified within the moderate category. This indicates that students experienced a fair level of improvement in their critical thinking skills after the implementation of the Problem-Based Learning model. The lowest N-Gain score recorded was 0.14, showing that a small number of students achieved only a limited improvement, whereas the highest score reached 1.00, indicating a very high level of improvement among certain students. In addition, the average percentage of N-Gain, which is 57.63%, also falls within the moderate range. Overall, these findings suggest that the PBL model contributed to a moderate enhancement of students' critical thinking abilities.

Furthermore, to strengthen the research findings, an observation of teacher and student activities was conducted during the implementation of the PBL model. The observation was carried out using an observation sheet over two meetings to examine the implementation of PBL syntax during the learning process. Teacher and student activities during the implementation of the PBL model were documented through classroom observation, and the findings are summarized in Table 8.

Table 8. Observation of Teacher and Student Activities during PBL Implementation

Teacher Observation Sheet			
Meeting	**Score**	**Implementation (%)**	**Category**
1st	60	100 %	Very Good
2nd	60	100 %	Very Good
Student Observation Sheet			
1st	55	91,67%	Very Good
2nd	58	96,67%	Very Good

Based on Table 8, the observation results show that teacher activities during the implementation of the PBL model in both meetings reached an implementation percentage of 100% with a score of 60, which is categorized as very good. Meanwhile, student activities in the first meeting obtained a score of 55 with a percentage of 91.67%, and increased in the second meeting to a score of 58 with a percentage of 96.67%. Both meetings indicate that student activities were categorized as very good.

Effect of Problem-Based Learning Model on Students' Critical Thinking Skills

The analysis of the collected data indicates that the Problem-Based Learning (PBL) model has a significant influence on the critical thinking skills of fourth-grade students in Integrated Science and Social Studies (IPAS), particularly in the topic of currency value at SDN Patereman 1. This improvement is reflected in the increase of the mean score from 48.45 in the pretest to 72.24 in the posttest. In addition, the paired sample t-test results reveal a significance value of less than < 0.001, which is below the 0.05 threshold, confirming a statistically significant difference between the two measurements. Overall, these results demonstrate that students' critical thinking abilities improved after the implementation of the PBL model.

The improvement in students' critical thinking skills is further supported by the N-Gain analysis, which indicates that the PBL model produced a consistent effect on learning development. In addition, there was a noticeable increase in students' achievement scores, ranging from a minimum of 35 to a maximum of 90 after the implementation of the model. This change reflects a transition in the learning process from a teacher-centered approach to a more student-centered learning environment, in which students take a more active role in classroom activities.

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Problem-Based Learning is characterized by the use of real-world problems as the starting point of instruction, which encourages students to participate actively in analyzing and solving problems independently. This approach makes the learning process more meaningful for students (Putri et al., 2025; Ariawan, 2024). Moreover, PBL allows learners to construct their understanding through direct engagement with real-life situations. Such learning experiences have been shown to enhance students' analytical abilities in Integrated Science and Social Studies (IPAS) (Lestari & Sari, 2025).

The initial stage of PBL, namely problem orientation, plays an important role in stimulating students to engage in independent inquiry, which in turn contributes to the development of their critical thinking skills (Rahmadhani & Fauziah, 2024). The connection between the problems presented and students' daily lives plays an important role in helping them find relevant solutions (Putri & Zulfadewina, 2023). Thus, the PBL model enables students to engage in more analytical and independent thinking while also connecting learning content with real-life situations. This process supports the optimal development of their critical thinking skills.

Implementation of the Problem Based Learning Model in Student Learning Activities

The implementation of the Problem-Based Learning (PBL) model was proven to stimulate aspects of critical thinking that were previously difficult to emerge in conventional learning. Through the syntax of orienting students to problems, students were guided to analyze issues related to genuine and counterfeit money through observation and discussion activities in order to find appropriate solutions. Students' ability to analyze and determine the authenticity of money based on their observations indicated the development of independent thinking skills. Students were also trained to identify problems and formulate initial assumptions regarding the differences in the characteristics of the observed money. This finding is consistent with Rosida & Nuvitalia (2024), who emphasized that the initial stage in PBL is crucial in developing students' logical thinking patterns to examine the root of problems in depth.

Furthermore, in the syntax of organizing students for learning, the teacher divided students into small groups and provided directions regarding the investigation activities to be conducted. At this stage, students began discussing to formulate initial assumptions and determine investigation steps in solving the given problems. Students also understood their group tasks through worksheet (LKPD) activities aimed at analyzing the characteristics of genuine and counterfeit money using the provided learning media. Group organization in the PBL model helped students learn to collaborate while also training their ability to exchange ideas and defend arguments during the problem-solving process. This is in line with the study conducted by Ambarwati & Widodo (2023), which stated that communication and collaborative discussion in the PBL model help students share perspectives and analyze possible solutions to a given problem.

In the syntax of guiding individual and group investigations, the influence of the PBL model became increasingly evident as students conducted observations and analyses of the money media used during the learning process. At this stage, students carried out investigations individually and collaboratively through worksheet (LKPD) activities to determine the authenticity of money based on their observations. The use of learning media in the form of genuine money and toy money helped students understand the material in a more concrete and contextual manner. Students not only observed the characteristics of money but also evaluated the results of their observations and provided logical reasons for the decisions they made. This finding is in line with Erisanti et al. (2024), who stated that the use of concrete media in the PBL model can create meaningful learning experiences. As explained by Wulandari et al. (2023), students' critical thinking strategies develop rapidly when they are given opportunities to conduct investigations requiring accurate and reflective decision-making.

At the stage of developing and presenting work results, students were challenged to communicate the results of their analyses and solutions to the problems encountered during the learning process. Students presented the results of group discussions accompanied by logical reasons supporting their decisions in determining the authenticity of money. This intensive interaction fostered students' collaborative skills in formulating solutions together (Mulyani et al., 2024). The increase in students' enthusiasm reaching 96.67% indicated a reduction in passive behavior among students who had previously tended to remain silent due to their familiarity with lecture-based methods. This increase in activity demonstrated that students became more actively involved in every stage of PBL-based learning, starting from problem orientation, group organization, investigation activities, and the presentation and evaluation of problem-

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solving results in accordance with the PBL syntax (Arends, 2012). This finding is consistent with the study of Permatasari & Satianingsih (2025), which emphasized that social interaction and presentation activities within the PBL syntax play an important role in fostering students' confidence in expressing arguments and respecting others' perspectives.

Finally, in the syntax of analyzing and evaluating the problem-solving process, students and the teacher reflected on the entire series of learning activities regarding genuine and counterfeit money. The use of learning media in the form of genuine money and toy money facilitated students in reevaluating the results of the analyses they had conducted. At this stage, students were trained to reassess the accuracy of the decisions they made and correct mistakes based on discussion results and collective reflection. This is in line with the principles of IPAS learning in the Merdeka Curriculum, which emphasizes meaningful learning experiences (Erisanti et al., 2024). Active involvement in the evaluation stage stimulated the emergence of reflective analytical skills, enabling students to improve their thinking patterns in solving problems in the future.

Based on the overall explanation above, it can be emphasized that the implementation of the Problem-Based Learning model had a significant effect on the critical thinking skills of fourth-grade students at SDN Patereman 1. This effect was reflected in students' ability to analyze problems, determine the authenticity of money based on observation results, and provide logical reasons for the decisions made during the learning process. Through the implementation of the PBL syntax, students became more active and engaged in contextual problem-solving processes related to the topic of currency value. These findings indicate that the PBL model is capable of creating meaningful learning experiences while supporting the development of students' critical thinking skills in IPAS learning. Nevertheless, several challenges were still encountered during its implementation, such as limited time in managing learning activities and students' adaptation process due to their previous reliance on conventional teaching methods. These challenges can be addressed through more effective classroom management and more structured guidance so that the learning process can run optimally.

CONCLUSION

Drawing on the results and discussion, it can be concluded that the Problem-Based Learning (PBL) model has a significant positive effect on students' critical thinking skills in Integrated Science and Social Studies (IPAS), particularly on the topic of currency value at SDN Patereman 1. The improvement is evident from the increase in the mean score, which rose from 48.45 in the pretest to 72.24 in the posttest. This finding is supported by the paired sample t-test result, which shows a significance value of less than < 0.001, indicating a statistically significant difference before and after the implementation of the PBL model. Furthermore, the N-Gain score of 0.5764 falls within the moderate category, suggesting a reasonably effective level of improvement in students' critical thinking skills. This result is also reinforced by the high level of learning implementation, as shown by teacher activity reaching 100% and student activity increasing up to 96.67%. Overall, these findings demonstrate that PBL creates an active, student-centered, and meaningful learning environment that encourages students to engage more deeply in problem-solving activities related to the identification of genuine and counterfeit money. Thus, PBL can be considered an effective instructional approach for enhancing elementary students' critical thinking skills, especially in contextual IPAS learning related to currency value materials.

Based on these findings, it is recommended that teachers optimize the implementation of the Problem-Based Learning model by managing time more effectively and providing more structured guidance to ensure that all stages of the learning process are carried out optimally. Teachers are also encouraged to utilize concrete learning media, such as genuine money and toy money, to support students' understanding of currency value materials in a more contextual and meaningful manner. In addition, future researchers are encouraged to conduct further studies by involving a control group or a larger sample size in order to obtain more comprehensive and generalizable results.

ACKNOWLEDGMENT

The author would like to express sincere gratitude to the principal, fourth-grade teacher, and all fourth-grade students of SDN Patereman 1 for their support and participation in this research. The author also extends sincere

appreciation to Priyono Tri Febrianto, S.Sos., M.Si., as academic supervisor, for his guidance, valuable suggestions, and support throughout the research process and the preparation of this article. The author also gratefully acknowledges the financial support provided, which contributed to the successful completion of this study.

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JURNAL ILMIAH ILMU PENDIDIKAN DAN SOSIAL
ISSN: 2086-6135 E-ISSN: 2541-612x
Volume 15 No. 2. Juni 2026 https://ejournal.unibabwi.ac.id/index.php/sosioedukasi/index

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