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Problem-based learning to develop critical thinking of elementary school students in Indonesian

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ABSTRACT

Critical thinking skills are among the foremost essential competencies in 21st-century education, playing a crucial role in effective decision-making and systematic problem-solving. This study aimed to analyze the impact of implementing Problem-Based Learning (PBL) to enhance critical thinking skills of elementary school students in Indonesian language learning. The method employed is a systematic literature review guided by the PRISMA protocol, encompassing the identification, screening, and analysis of relevant studies. The findings revealed that PBL significantly improves students' abilities in analysis, logical reasoning, evaluation, and argument construction. Beyond cognitive skills, PBL also enhances social skills such as communication and collaboration within the learning process. Challenges faced in PBL implementation include limited time, teacher preparedness, and curriculum demands. Overall, PBL proves to be an effective and relevant instructional approach for cultivating critical thinking skills, particularly in Indonesian language education at the elementary level. These findings support the adoption of PBL in teaching practices to create more meaningful, student-centered learning experiences.

INTRODUCTION

Critical thinking skills are widely recognized as one of the most essential competencies for 21st-century education. These skills play a key role in enabling students to make informed decisions, solve problems systematically, analyze information, and conduct studies in accordance with scientific principles (Arda et al., 2024; Mardhiyah et al., 2021). Within the framework of 21st-century competencies, critical thinking is one of the 4Cs (critical thinking, creativity, collaboration, and communication) that underpin lifelong learning and adaptability in the modern world (Thornhill-Miller et al., 2023). According to Syafitri et al. (2021), critical thinking allows students to think logically and rationally when facing challenges, while also enhancing accuracy and the quality of reasoning. On a broader scale, organizations such as UNESCO and the OECD emphasize that critical thinking is not only a cognitive skill but also a social and ethical capacity essential for navigating the complexity of the digital era (Okada et al., 2025). In line with this, Putri (2024) highlights that developing critical thinking skills from an early age is crucial to help elementary school students manage the overflow of information and misinformation they encounter daily.

Despite its recognized importance, empirical evidence indicates that students' critical thinking skills remain below expectations. Data from the Programme for International Student Assessment (PISA, 2022) and the OECD (2023) report show that Indonesian students' performance in literacy and reasoning skills continues to lag behind the international average (Ariyani et al., 2025; Wijaya et al., 2024). Supporting this, Amami & Wahyuni (2022) found that one of the most persistent challenges in Indonesian schools is the limited ability of students to analyze and evaluate information critically. Local classroom observations and interviews conducted at SD Pangudi Luhur Surakarta further confirm this issue, 68% of fifth-grade students struggled with analyzing problems, formulating logical arguments, and evaluating alternative solutions, and only 32% were able to solve higher-order literacy problems effectively. Lestari et al. (2019) similarly found that many students become passive when confronted

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with analytical questions, indicating a lack of exposure to learning models that cultivate reasoning. These conditions suggest that critical thinking is still underdeveloped in classroom practice due to the predominance of teacher-centered method**s**, where students receive knowledge rather than construct it actively.

In fact, the ability to think critically at the elementary stage serves as the foundation for developing higher-order thinking skills (HOTS) at later levels of education. Moreover, language learning provides a unique context for developing critical thinking, as it inherently involves reasoning, interpretation, and communication—skills that are central to both literacy and cognitive growth. Numerous studies Mardhiyah et al. (2021), Syafitri et al. (2021), and fitriya et al. (2022) have emphasized the need to strengthen students' critical thinking abilities. Therefore, exploring PBL in the context of Indonesian language learning is timely and pedagogically significant. The Problem-Based Learning (PBL) model presents a constructivist, student-centered approach in which learners actively build understanding through engagement with meaningful and authentic problems (Kiawati et al., 2023). In PBL, students are encouraged to participate in group discussions, analyze issues, search for information, and propose evidence-based solutions, all of which stimulate higher-order thinking processes (Rambe et al., 2023). The stages of PBL problem presentation, guided inquiry, collaborative solution-building, and reflective evaluation create opportunities for students to practice reasoning, argumentation, and metacognitive reflection (Susilawati & Supriyatno, 2023). Through this approach, students are not only expected to comprehend learning materials but also to develop logical reasoning and problem-solving abilities relevant to real-life contexts.

Evidence from several empirical studies supports the effectiveness of this model. Lestari et al. (2019) found that students who learned through PBL showed a 19% increase in critical thinking scores compared to those in conventional classes. Similar findings were also reported by Atmasari et al. (2024), who demonstrated that PBL significantly improves analytical and interpretive skills in Indonesian language learning. These findings underline that PBL creates an environment where students actively engage with problems, discuss ideas collaboratively, and construct knowledge through critical reflection. However, most of these studies were conducted at the secondary or tertiary level and predominantly focused on science and mathematics education. Research that specifically investigates the application of the Problem-Based Learning (PBL) model to enhance critical thinking at the elementary school level, particularly in Indonesian language learning remains limited.

In light of these observations, this study aims to analyze and synthesize research related to the application of the PBL model in Indonesian language learning at the elementary level. Theoretically, this study contributes to a deeper understanding of how PBL fosters critical thinking and literacy development in young learners. Practically, the study provides insights and evidence-based recommendations for teachers to implement innovative learning strategies that support the goals of the Kurikulum Merdeka and the broader mission of Indonesia's 21st-century education reform.

RESEARCH METHODS

This research method used a systematic literature review method. Systematic literature review is a method used to review a wide range of relevant literature using the help of questions that must be answered by the researcher. This study was carried out realistically by identifying, selecting, and assessing relevant literature, namely those related to PBL and critical thinking skills (Ramirez-Montoya, 2020) After collecting various existing literature, then screening was carried out to ensure that the sources taken were relevant and of high quality. The quality of inclusion and exclusion is determined to select studies that meet the requirements, such as the year of publication, the type of research, and the methodology used.

The author applies the PRISMA Protocol (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) as a guideline in this study. The selection of primary studies was conducted through four main stages based on PRISMA as follows (Rahmawati et al., 2022).

1. Identification which involved searching the literature through national and international databases relevant to Indonesian language learning, both in Indonesian and English, and limited

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to open access articles. The keywords used included "Indonesian language learning," "literacy education," and "Indonesian teaching methods."

2. Screening, in which duplicate articles were removed from the initial identification results, and an initial selection was made based on the title and abstract to ensure relevance to the topic of Indonesian language learning.
3. Feasibility (Eligibility) determination, which involves articles that pass the screening stage being further analyzed through a full-text review to evaluate their suitability with the inclusion criteria, namely: empirical-based research, focus on Indonesian language learning, and relevance to the study objectives. Articles that did not meet the criteria, such as opinions, editorials, or research outside the context of Indonesian language, were eliminated.
4. Inclusion consists of articles that meet all criteria and are then included as primary studies analyzed in this study.

The reference search process is limited to the relevant discipline, namely Indonesian learning, with open access to all resources, as well as the use of Indonesian and English as the main languages in the analyzed references.

RESULTS AND DISCUSSION

Result

To provide a clearer overview of the article selection process following the PRISMA protocol, the results of each screening stage are presented in Table 1. This table summarizes the number of studies identified, excluded, and finally included in the analysis. Presenting the data in tabular form helps to visualize the systematic process of identifying, screening, and selecting relevant studies before detailed discussion.

Table 1. Results of PRISMA Protocol Implementation

PRISMA Stage	Number of Articles	Description
Identification	45	Articles initially identified related to the application of Problem-Based Learning (PBL) in Indonesian language learning.
Screening	25	20 articles excluded after title and abstract review because they focused on PBL in other subjects (science, mathematics, social studies) or at different education levels (secondary or tertiary).
Eligibility	12	13 full-text articles were reviewed but excluded as they did not meet the inclusion criteria (e.g., conceptual papers, opinion pieces, or lacking empirical data).
Included in the final analysis	12	Articles that met all inclusion criteria and were analyzed to assess the impact of PBL on Indonesian language learning in elementary schools.

Following the selection process, 12 articles were included in the final analysis. The overall findings indicate that the application of the Problem-Based Learning (PBL) model in Indonesian language learning at the elementary level has a positive impact on students' critical thinking skills.

Quantitative Results

A synthesis of the quantitative data from the selected studies revealed consistent evidence that PBL significantly improves students' critical thinking skills in the context of Indonesian language learning. A study conducted by Atmasari et al. (2024) showed a significant increase in students' critical thinking skills after participating in problem-based learning. The average critical thinking skills score increased from 66.67% to 83.83%. The increase was most prominent in the indicators of analytical reasoning, inference-making, and logical consistency, suggesting that structured problem scenarios within PBL stimulate deeper levels of reasoning and reflection. Another study conducted by Hastawan et al. (2023) also supports these findings. They reported an increase in critical thinking skills scores from 56.15% to 82.3% after implementing the PBL model. This improvement was reflected in students'

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ability to understand texts, identify main ideas, and compare information from various sources. This indicates that PBL not only improves higher-order thinking skills but also strengthens students' literacy skills.

Meanwhile, research by Feranti et al. (2024) shows that students who learn using PBL have much higher critical thinking scores than the control group who use the lecture method. These results confirm that PBL is superior to traditional approaches in developing critical thinking skills, as students are given the opportunity to construct arguments, test hypotheses, and make decisions based on the information they obtain. This suggests that the student-centered nature of PBL creates cognitive engagement and self-regulated inquiry processes, which are rarely achieved in conventional, teacher-dominated classrooms. Furthermore, Lestari et al. (2019) and fitriya et al. (2022) found similar patterns students who engaged in real-world contextual problem-solving tasks demonstrated an average increase of 15–25% in their ability to analyze, synthesize, and evaluate information. Collectively, these studies demonstrate a consistent quantitative trend that supports the effectiveness of PBL in improving multiple dimensions of critical thinking.

Qualitative Results

In addition to quantitative findings, a number of studies also report qualitative results that reinforce the effectiveness of PBL. Indrawati et al. (2024), for example, documented an increase in student enthusiasm in the group discussion process. Students showed greater confidence when expressing their opinions and had more systematic abilities in constructing arguments, both verbally and in writing. Likewise, Kiawati et al. (2023) reported that PBL encouraged students to engage in collaborative dialogue and reflective questioning, leading to more meaningful comprehension of Indonesian language texts. Teachers also noted improved classroom dynamics, with students assuming more responsibility for their own learning through exploration and peer feedback.

Other studies Rambe et al. (2023) and Susilawati & Supriyatno (2023) highlighted how PBL promotes metacognitive awareness students became more aware of their own thought processes and began to evaluate the accuracy and logic of their responses independently. This metacognitive shift is crucial in supporting long-term skill transfer, particularly in literacy-based subjects like Indonesian. Collectively, the qualitative findings emphasize that PBL not only enhances academic outcomes but also contributes to the development of 21st-century competencies, including communication, collaboration, creativity, and self-directed learning.

Synthesis

Synthesizing both quantitative and qualitative data reveals several important themes:

1. Cognitive Development
   PBL consistently strengthens analytical, evaluative, and inferential thinking skills. Students become more adept at identifying main ideas, analyzing textual structures, and constructing evidence-based conclusions.
2. Literacy Enrichment
   The integration of PBL in language learning encourages students to approach texts critically, questioning author intent, comparing sources, and contextualizing information. This leads to measurable improvement in reading comprehension and argumentation writing.
3. Affective and Behavioral Impact
   PBL fosters intrinsic motivation and curiosity. Students show higher engagement and persistence when faced with complex linguistic or interpretative challenges, indicating a shift from passive to active learning behaviors.
4. Collaborative and Communicative Competence
   Group-based problem solving in PBL develops social interaction skills and teamwork. Students practice negotiation, perspective-taking, and respectful discourse—skills aligned with the 4Cs (critical thinking, communication, collaboration, and creativity) framework.

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5. Pedagogical Transformation
   The success of PBL implementation highlights the need for a paradigm shift from teacher-centered to student-centered instruction in Indonesian elementary schools. Teachers serve as facilitators and mentors, guiding inquiry rather than delivering.

Overall, the findings of this systematic review demonstrate that the Problem-Based Learning (PBL) model effectively enhances students' critical thinking skills across multiple cognitive and affective dimensions. The results consistently indicate improvements in analysis, synthesis, and evaluation abilities, as well as in literacy comprehension and social collaboration. Moreover, the studies suggest that PBL implementation contributes to a broader transformation of classroom culture—creating learning environments that are more interactive, reflective, and aligned with the goals of 21st-century education.

Discussion

The Effectiveness of PBL on Critical Thinking Skills

Based on the synthesis of several reviewed studies, the Problem-Based Learning (PBL) model demonstrates strong potential as an effective pedagogical approach for enhancing students' critical thinking skills, particularly in Indonesian language learning at the elementary school level. Rooted in the constructivist paradigm, PBL enables learners to actively construct meaning through engagement with authentic and contextual problems. This aligns with the view of Rambe et al. (2023), who found that PBL promotes active learning and supports the development of higher-order thinking through inquiry-based activities and reflection.

Empirical evidence consistently demonstrates significant gains in students' analytical, evaluative, and inferential abilities following the implementation of PBL. Lestari et al. (2019) reported a 19% improvement in critical thinking indicators, which was mirrored in Atmasari et al. (2024) and Hastawan et al. (2023), where similar gains were noted in logic and reasoning skills. These improvements suggest that students exposed to real-world problem-solving contexts become more capable of interpreting and evaluating textual meaning critically. Yusita et al., (2021) further emphasized that PBL positively affects students' abilities to comprehend implicit meanings and to link textual information with real-life experiences, thus transforming Indonesian language learning from rote memorization to reflective inquiry.

Moreover, PBL promotes cognitive flexibility students learn to approach linguistic problems from multiple perspectives, synthesize ideas, and construct well-reasoned arguments. Such findings strengthen the theoretical claim that PBL not only enhances content understanding but also cultivates the mental habits of reasoning, questioning, and evaluating which are central to critical thinking.

Student Motivation and Engagement

Beyond cognitive development, PBL has a strong impact on learners' affective and motivational dimensions. According to Susilawati & Supriyatno (2023), the model enhances intrinsic motivation by giving students greater autonomy and ownership over their learning process. This autonomy nurtures curiosity and persistence, two critical factors for sustaining lifelong learning, particularly at the elementary level where learning attitudes are still forming.

When learners are presented with authentic, real-life problems relevant to their daily context, they perceive learning as meaningful rather than abstract. This is consistent with Deci and Ryan's Self-Determination Theory, which emphasizes that autonomy and relevance increase intrinsic motivation. Several studies Feranti et al. (2024) and Kiawati et al. (2023) observed that students in PBL settings showed higher levels of engagement, asked more questions, and participated actively in group discussions. Consequently, the PBL model not only supports cognitive growth but also cultivates learning engagement, which is crucial for maintaining long-term academic resilience and success.

Development of Social Skills and 4Cs

A notable finding across the reviewed studies is that PBL contributes significantly to the development of social and interpersonal competencies. Putri et al. (2025) found that students who

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participated in PBL-based Indonesian language classes exhibited substantial improvements in communication, collaboration, and social responsibility. This corresponds with the framework of 21st-century competencies, the 4Cs (Critical Thinking, Creativity, Communication, and Collaboration) as proposed by (Ataizi & Donmez, 2020).

Collaborative group work in PBL encourages learners to articulate ideas clearly, listen to others' perspectives, and engage in respectful discourse. Sulaeman (2024) emphasized that such group discussions enhance students' confidence and empathy, transforming the classroom into a micro-community of inquiry. These interpersonal skills are not merely supplementary; they are integral to literacy learning, as language inherently functions as a social tool for negotiation and meaning-making. Therefore, PBL creates a dual impact, enhancing both academic literacy and social-emotional learning (SEL) competencies that are indispensable for holistic education.

Challenges in Implementing PBL in Elementary Schools

Despite its many benefits, the successful implementation of PBL in elementary education is challenged by several contextual and structural barriers. Teachers are required to have good facilitation skills, from designing problem scenarios according to students' cognitive levels to guiding discussions without being too dominant. Nuragnia et al. (2021) pointed out, time constraints, assessment pressure, and dense curricula hinder the adoption of student-centered models such as PBL. Moreover, many teachers lack professional development opportunities that would equip them with facilitation skills to guide inquiry-based discussions effectively.

To overcome these challenges, schools must adopt a phased implementation strategy that includes teacher training, collaborative lesson planning, and the integration of reflective evaluation tools. The inclusion of digital learning resources can also alleviate these challenges by providing accessible materials for students' inquiry activities. Addressing these limitations is essential to ensure that PBL can be sustained as part of a long-term pedagogical reform rather than as an isolated innovation.

Conceptual Support and External Context

The effectiveness of PBL can be theoretically explained through constructivist learning theories advanced by Piaget and Vygotsky, which emphasize knowledge construction through interaction and experience (Slavin, 2020). In the context of Indonesian language learning, PBL transforms the subject from being grammar-centered to meaning-centered helping students view language as a dynamic tool for communication, reasoning, and problem-solving.

External supports are equally crucial to maximize the impact of PBL. Razak et al. (2022) noted that technological integration, such as using digital platforms for information retrieval and collaboration, enhances the inquiry process and broadens students' access to diverse sources. Additionally, Sarivah et al. (2022) emphasized the role of parental and community involvement, which fosters accountability and reinforces classroom learning at home. When students receive consistent support from teachers, families, and peers, their motivation, confidence, and achievement levels increase significantly.

Implications and Future Directions

This discussion highlights that PBL is not merely a teaching method but a transformative learning model that aligns with national education goals to develop creative and critical citizens. For educators, integrating PBL into Indonesian language learning can serve as an entry point for broader curriculum reform that emphasizes student-centered learning and higher-order thinking.

Future studies should investigate longitudinal impacts of PBL on literacy and critical thinking development, as well as explore its integration with digital storytelling, project-based assessment, or hybrid learning environments. By expanding these approaches, PBL can continue to evolve as a sustainable model that not only improves students' cognitive performance but also nurtures their character, collaboration, and civic responsibility.

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CONCLUSION

The results of this systematic review show that the application of the Problem-Based Learning (PBL) model in Indonesian language learning at the elementary school level has significant implications for the development of students' critical thinking skills. PBL strengthens the constructivist learning framework by encouraging active, contextual, and collaborative knowledge building. Empirical evidence from the reviewed studies confirms that PBL not only improves learning outcomes cognitively but also hones higher-order thinking skills such as analysis, synthesis, evaluation, and argument construction.

In conclusion, PBL can be considered a relevant and effective learning model to support the implementation of the Independent Curriculum in Indonesia. By integrating PBL into classroom practice, teachers are able to create more meaningful, student-centered, and transformative learning environments that foster 21st-century competencies, particularly critical thinking. This positions PBL as a strategic pedagogical alternative for Indonesian language learning in primary education.

This study, however, has several limitations as it is based on secondary sources through a systematic literature review. Future research should conduct classroom-based empirical studies with experimental or mixed-methods designs to validate these findings in practice. It is also recommended that future studies examine additional variables such as students' learning styles, teachers' readiness, and school environment support, as well as explore the impact of PBL at different educational levels.

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