Enhancing Primary School Students' Critical Thinking Skills Through Problem-Based Learning: An Intervention Study in Pancasila Education

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Abstract

This study aims to determine the effect of the Problem Based Learning (PBL) model on improving the critical thinking skills of third-grade students in Pancasila Education at MI Hidayatul Ulum Tempel, motivated by low initial critical thinking scores (42% classical completeness in the pre-action phase) due to conventional teacher-centered methods. The research employed a Classroom Action Research (CAR) design using the spiral model of planning, acting, observing, and reflecting across two cycles. Data collection utilized critical thinking essay tests based on Robert Ennis's indicators (*focus, reason, inference, situation, clarity, overview*), analyzed using descriptive statistics to measure classical completeness, and observation sheets to measure the fidelity of the PBL implementation process. The research findings demonstrated a significant increase in critical thinking skills: classical completeness rose from 42% in the pre-action to 69% in Cycle I, and finally achieved 85% at the end of Cycle II, successfully surpassing the research target of 80%. This improvement was strongly correlated with the optimal implementation of the PBL model, which increased from a "Less" category (56% student activity) in the early stages of Cycle I to a "Very Good" category with 100% fulfillment of PBL syntax in Cycle II. It is concluded that the structured application of the PBL model is highly effective in developing critical thinking skills by facilitating active engagement and problem-solving, particularly for students in the concrete operational stage.

Keywords: Problem Based Learning, Critical Thinking, Pancasila Education, Classroom Action Research, Elementary School.

1. Introduction

Educational attainment nationally and regionally determines the socioeconomic development as a result of the integration of educational attainment and the development of a nation's human capital (Adams, 2002; Jorgenson & Fraumeni, 1992; Shavkidinova et al., 2023). Within the 21st century context, education is expected to facilitate the acquisition of higher-order thinking skills, that is, critical thinking, problem-solving, and decision-making to adequately address and respond to the challenges of the 21st century (Culver et al., 2019; Singh & Agarwal, 2024). Thus, there is a global trend of educational

reforms to implement and promote learner-centered pedagogies that enhance active engagement and self-directed learning from the early years of schooling. The Indonesian education system has prioritized the development of critical thinking skills in line with the national educational policy of Higher Order Thinking Skills (HOTS) and Pancasila Student Profile (Departments, 2013). A good number of studies report on the importance of critical thinking, as a fundamental competency of a good citizen, to promote academic achievement and enhance lifelong learning (Hitchcock, 2017; Peters, 2015). As for the elementary education level, the need to foster critical thinking is paramount as early cognitive stimulation has a long-lasting impact on students' intellectual growth (Daga et al., 2022; Sarwanto et al., 2021).

Policies intended to bolster the development of elementary school students' critical thinking skills have not successfully worked to strengthen the skills as students even in teacher-centered contexts and classrooms struggle to think critically (Suratmi & Sopandi, 2022; Tang, 2023). Such traditional teaching and pedagogical techniques lead to the students being knowledge recipients without thinking critically, asking questions, and reflecting (Alam, 2023; Ghafar, 2023). Such a lack of critical thinking reflects a serious pedagogical misalignment, especially in the case of Education Pancasila and Civic Education subjects which are critical in nature, and require students to use advanced thinking skills that employ values, and critical problem-solving to resolve issues relevant to the context.

The nature of elementary school students as they are 8 to 9 years of age amplifies the problem from the psychological development point of view with respect to the students. According to Piaget's theory of the Concrete Operational Stage, a child of that age will be starting to use logical reasoning, though only as long as it is in a concrete or real context (Fatimah, 2021; McLeod, 2018; Piaget, 2005; Piaget & Inhelder, 2014). Learning environments with a lot of abstract content outside of rote learning will not be developmentally appropriate and will restrict students' reasoning skills (Hayat et al., 2024; Vo & Csapó, 2022).

Over the years, Problem-Based Learning (PBL) has been championed by an international body of research as an effective model of instruction in promoting critical thinking in education across the spectrum. Tirelessly acknowledging the role of authentic problems, collaborative inquiry, hypothesis generation, as well as reflection, PBL has been closely linked to the aforementioned variables in the literature (Almulla, 2020; Hmelo-Silver, 2004; Kwan, 2009). A plethora of systematic reviews and meta-analyses have shown that PBL is far superior to the traditional expository approach in promoting critical thinking in students, especially for contextualized, and learner-driven tasks (Nadeak & Naibaho, 2020; Wijnia et al., 2024; Yu & Zin, 2023).

Notwithstanding the above, the international literature has made an intriguing, but troubling observation. First, most empirical PBL studies have been centred around the disciplines of science and mathematics, or in the context of higher education, leaving a research void within value-based and civic education PBL elementary settings (Gusman et al., 2023; Richter-Beuschel & Bögeholz, 2019). Second, as a consequence of the void above, most of these studies predominantly entail experimental or quasi-experimental research designs, thus shedding limited understanding of the potential of PBL as a corrective pedagogical intervention in real-life classrooms characterized by teacher-

centered approaches (Lesperance, 2008; Napathorn, 2022; Nurkhin & Pramusinto, 2020). Third, integration of Pancasila Education (PE), PBL, and critical thinking frameworks (for instance, Ennis), as well as students' stages of cognitive development, is still feeble, and thin within the international corpus.

However, most previous studies report the positive outcomes from the PBL cycle, but few study the instructional refinement process through Classroom Action Research (CAR) and how that refinement process transforms the effectiveness of the PBL process at the elementary school level, thus leaving a void in understanding the process of pedagogical metamorphoses, particularly in situations in which the teachers and students are moving from a traditional and instructivist pedagogical stance to a constructive and learner-centered paradigm (Clausen, 2023; Gennen, 2023). The present study aims to empirically study the effectiveness of PBL Design as a pedagogical intervention to improve the third graders' Pancasila Education critical thinking skills using the Classroom Action Research paradigm. Different from the other studies, this study attempts to locate PBL within the framework of students in concrete operational stage and aims to measure its effect through the application of Robert Ennis' six critical thinking indicators. This study aims not only to assess the learning outcomes through the cycle, but to also demonstrate the pedagogical processes which PBL used to facilitate the transformation in the classroom and the thinking Process of students at higher logical levels.

This project addresses the international scholarship on the intersection of problem-based learning and critical thinking within elementary education in three distinct manners. First, the work has extended the integration of Problem Based Learning into Pancasila (civic and value-based) Education within elementary schooling. This area of inquiry within PBL has been underexplored as prior research on PBL has focused on science, math, and higher education, while the subject of Pancasila Education is highly conceptually complex. Second, this scholarship broadens the methodological framework within elementary education as it utilizes Classroom Action Research (CAR) to explore not only the extent to which PBL impacts critical thinking, but in what ways the iterative changes to pedagogy and reflection cycles enhance or diminish that impact within the constraints of a teacher-centered classroom. Third, this scholarship advances the discourse within a more balanced developmental framework that synthesizes PBL with the concrete operational stage of Piaget and critical thinking indicators defined by Robert Ennis, thereby documenting with a higher degree of fidelity the triggers to higher-order thinking that can be activated by well-crafted problem scenarios and well-planned scaffolding for learners (ages 8-9). This work advances the scholarship in elementary civic education and critical thinking and builds on a number of theories in globalization, pedagogy, and educational systems.

2. Methods

Although Classroom Action Research (CAR) is often associated with localized instructional improvement, its use in this study is grounded in a systematic and rigorous research framework that aligns with internationally recognized standards of qualitative and intervention-based inquiry. CAR is not merely a reflective teaching practice, but a structured research design that emphasizes cyclical refinement, analytical transparency, and theory-informed action (Kemmis, Heikkinen, et al., 2014; Kemmis, McTaggart, et al.,

2014). The cyclical stages of planning, action, observation, and reflection employed in this study enable the documentation of pedagogical change processes over time, which is increasingly acknowledged as a valuable form of scholarly evidence in educational research focusing on instructional transformation and implementation fidelity (Anderson & Shattuck, 2012).

The methodological rigor of this study is further strengthened through the use of theory-driven and validated analytical instruments. Students' critical thinking skills were assessed using essay-based tests explicitly derived from Robert Ennis's critical thinking framework, ensuring construct validity and conceptual alignment with internationally accepted definitions of critical thinking (Ennis, 2015, 2018). In parallel, the observation instruments for teacher actions and student activities were systematically structured according to established Problem-Based Learning (PBL) syntactic stages, allowing for objective monitoring of instructional quality rather than impressionistic classroom evaluation (Hmelo-Silver, 2004; Kwan, 2009).

To enhance credibility and trustworthiness, this study applies methodological triangulation by integrating multiple data sources, including test results, structured classroom observations, and institutional documentation. Such triangulation is widely recognized as a key strategy for strengthening qualitative research rigor and minimizing single-source bias (Creswell & Poth, 2016; Lincoln, 1985). The involvement of an external observer during the observation phase further supports intersubjective validation and reduces potential researcher bias, while expert judgment in instrument validation reinforces content relevance and methodological coherence (Ennis, 2018).

From an international scholarly perspective, the value of this CAR-based study lies not only in measuring learning outcome improvement, but in generating process-oriented empirical insights into how Problem-Based Learning operates within authentic classroom constraints. Similar to design-based research paradigms, CAR allows researchers to examine the interaction between instructional design, learner characteristics, and classroom context, producing transferable pedagogical knowledge rather than context-bound findings (Anderson & Shattuck, 2012; Reimann, 2010; Sandoval & Bell, 2004). By systematically tracing instructional refinement across cycles, this study contributes empirically grounded evidence on scaffolding, classroom adaptation, and cognitive progression among concrete operational learners, thereby positioning CAR as a rigorous and internationally relevant research approach.

3. Results

The results of this Classroom Action Research describe the empirical changes in students' critical thinking skills and the quality of instructional implementation following the application of the Problem-Based Learning (PBL) model. The findings are presented descriptively based on data obtained from critical thinking tests and structured classroom observations conducted across the Pre-Action phase, Cycle I, and Cycle II. The presentation integrates narrative explanations with tabulated data to ensure clarity, transparency, and coherence.

Initial findings from the Pre-Action phase indicate that students' critical thinking skills were considerably below the expected standard. Based on the essay-based critical thinking test developed according to Robert Ennis's six indicators—focus, reason,

inference, situation, clarity, and overview—only 11 out of 26 students achieved the minimum mastery score of 75. This corresponds to a classical mastery percentage of 42%, as presented in Table 1.1. The remaining 15 students, representing 58% of the class, failed to meet the minimum completion criterion. These results place students' critical thinking abilities in the "Very Low Critical to Low Critical" category, demonstrating limited capacity to analyze problems, justify reasoning, and draw logical conclusions within the context of Pancasila Education learning activities.

Observation data collected prior to the intervention further confirmed that learning activities were dominated by teacher-centered instructional practices, with minimal student engagement in analytical or problem-solving tasks. This baseline condition provided a strong empirical justification for implementing a pedagogical intervention aimed at improving both the learning process and student outcomes. Following the implementation of the PBL model in Cycle I, measurable changes were observed in both instructional quality and student learning outcomes. Observation results show that during the first meeting of Cycle I, the implementation of teacher actions reached 60%, while student activity reached 56%, both categorized as Low. These findings indicate that although the PBL model had been introduced, several components of its instructional syntax were not yet optimally implemented. Challenges were particularly evident in classroom management, time allocation, and students' unfamiliarity with collaborative problem-solving activities.

In the second meeting of Cycle I, improvements in instructional implementation were recorded. Teacher action increased to 70%, and student activity increased to 68%, both categorized as Fairly Good, as shown in Table 1.2. This progression suggests that both the teacher and students began to adapt to the PBL approach, resulting in more active participation during group discussions and problem analysis stages, although some procedural inefficiencies remained. The improvement in instructional quality during Cycle I was accompanied by a corresponding increase in students' critical thinking skills. As shown in Table 1.1, the number of students achieving mastery increased from 11 in the Pre-Action phase to 18 students at the end of Cycle I. This resulted in a classical mastery percentage of 69%, representing a 27% improvement compared to baseline conditions. At this stage, students' critical thinking skills were categorized as "Moderately Critical." While this result did not yet meet the predetermined success criterion of 80%, it indicates a substantial positive shift in students' ability to engage with problem contexts, particularly in identifying relevant information and understanding situational aspects of the tasks.

Table 1.1. Development of Students' Learning Mastery and Critical Thinking Skills

Implementation Stage	Number Of Students Achieving Mastery (≥75)	Total Students	Classical Mastery (%)	Improvement	Critical Thinking Category
PRE-ACTION	11	26	42%	–	Very Low – Low Critical
CYCLE I	18	26	69%	27%	Moderately Critical
CYCLE II	22	26	85%	16%	Critical

Further refinement of instructional strategies was implemented in Cycle II based on reflections from Cycle I. Observation data demonstrate a significant improvement in the quality of PBL implementation during this cycle. In the first meeting of Cycle II, teacher action implementation reached 95%, and student activity reached 92%, both categorized as Very Good. These results indicate that improvements such as the establishment of permanent learning groups and enhanced classroom conditioning were effective in supporting smoother learning processes. In the second meeting of Cycle II, both teacher action and student activity reached 100%, indicating full adherence to all stages of the PBL instructional syntax. Students actively participated in identifying problems, collaborating in groups, presenting solutions, and engaging in reflective evaluation. Observation results summarized in Table 1.2 illustrate that instructional implementation had reached its optimal level by the end of Cycle II.

Alongside the improvement in instructional implementation, student learning outcomes continued to increase substantially in Cycle II. As shown in Table 1.1, the number of students achieving mastery increased to 22 out of 26 students, resulting in a classical mastery percentage of 85%. This represents a 16% improvement compared to Cycle I and exceeds the research success indicator of 80%. At this stage, students' critical thinking skills were classified within the "Critical" category. Improvements were observed across all six Ennis indicators, with notable gains in reasoning and inference abilities, which had been identified as the weakest components during the Pre-Action phase. Only four students remained below the mastery threshold at the end of Cycle II, indicating that the majority of students had successfully developed adequate critical thinking skills through the PBL intervention. The progressive increase in mastery percentages across cycles—from 42% in the Pre-Action phase, to 69% in Cycle I, and finally 85% in Cycle II—demonstrates a cumulative improvement of 43 percentage points over the course of the research.

Table 1.2. Observation Results of Teacher Actions and Student Activities

Observation Aspect	Cycle & Meeting	Percentage	Category
Teacher Action	Cycle I – First Meeting	60%	Low
	Cycle I – Second Meeting	70%	Fairly Good
	Cycle II – First Meeting	95%	Very Good
	Cycle II – Second Meeting	100%	Very Good
Student Activity	Cycle I – First Meeting	56%	Low
	Cycle I – Second Meeting	68%	Fairly Good
	Cycle II – First Meeting	92%	Very Good
	Cycle II – Second Meeting	100%	Very Good

Observation data further support this trend, showing that improvements in student learning outcomes were closely aligned with increases in instructional implementation quality. Teacher action improved consistently from 60% to 100%, while student activity increased from 56% to 100% across cycles, as summarized in Table 1.2. These findings

indicate that the effectiveness of the PBL intervention was strongly associated with the fidelity and consistency of its implementation. Overall, the results confirm that the systematic application and refinement of the Problem-Based Learning model through Classroom Action Research led to significant improvements in both the learning process and students' critical thinking skills in Pancasila Education. The integration of narrative findings with tabulated data provides clear empirical evidence of the progressive impact of the intervention across research cycles.

4. Discussion

The results show a constructive and continuous improvement of students' critical thinking skills in Pancasila Education, as the PBL approach, integrated with Classroom Action Research, is implemented systematically. Moving from the Pre-Action phase, where classical mastery was at 42%, to Cycle II, where it was at 85%, confirms the instructional efficacy of PBL. Additionally, it shows that critical thinking is a skill that can and should be developed, as evidenced by the coherent integration of instructional design, cognitive development, and pedagogical scaffolding. These results contribute to the ongoing discourse in the field of international education, which seeks to define constructive ways to understand and develop higher-order thinking skills at the elementary level instead of simply measuring them as an end product (Ennis, 2015; Facione & Gittens, 2015; Montibeller & Belton, 2006; Van der Brugge, 2018).

The little baseline performance shown is a Pre-Action phase shows a particular structural constraint in the teacher-centered instructional paradigm. While entering the realm of critical thinking theory, these teaching models and environments value information receipt rather than cognitive involvement of the learners, thus constraining the opportunities to practicing the analytical, evaluative, and inferential thinking, which is the core of critical thinking (Ennis, 2015; Facione & Gittens, 2015; Montibeller & Belton, 2006; Van der Brugge, 2018). This study's weak performance on the reasoning and inference facets replicates a plethora of international literature that documents a significant gap of student's ability to acquire critical thinking through mere engagement with the content (Culver et al., 2019; Halpern, 2014). This gap, in fact, confirms that a more sophisticated thinking ability cannot emerge from just attending classes. It needs more deliberate planning and structuring of the fabric of teaching and learning processes.

Examining the weak baseline outcomes, from a developmental perspective, the gap between teaching methods and the learners' cognitive stage is even more critical. In Piagetian terms, learners at the concrete operational stage (7–11 years) reason logically only through interaction with real, concrete, and contextual situations. High reliance on abstract and verbal explanations left students without the needed experiential anchors to build meaning and internalize the reasoning processes. This study attempts to validate this theory, providing evidence that only after the reorganization of teaching activities to concrete problem situations through PBL was there an improvement on students' critical thinking measures. Thus, the findings contribute to the theory of Piaget even at the level of applied instructional practices, demonstrating that the principles of cognitive constructivism may be very positively leveraged to guide instructional design.

The first cycle PBL's launch marked the start of a pedagogical shift from transmission learning to inquiry learning. Although implementation fidelity was still limited, the increase of classical mastery to 69% signifies that even partial engagement with authentic

problems can still initiate foundational critical thinking. This is consistent with constructive learning principles that advocate learning as the meaning maker process, as opposed to mere information recipient (Allen et al., 2011; Clausen, 2023; Dolmans & Schmidt, 1994; Hmelo-Silver, 2004; Prosser & Sze, 2014). At this stage, PBL mainly served as a cognitive catalyst that encouraged students to self question, collaborate and make meaning of the information. Still, the uneven progression of the cognitive operations of reasoning and inference leaves a gap that validates the statement that critical thinking is a construct that takes time and practice, and not a one off engagement.

The results from Cycle I point to an additional theoretical dimension, indicating that the development of critical thinking is fragile, and highly dependent on the quality of instruction and the level of scaffolding. As Halpern explains, critical thinking skills do not transfer from one context to another, and students must be directed toward certain thinking processes (Halpern, 2014). The procedural constraints evident in Cycle I, such as poor grouping and uneven facilitation, prevented students from working on deeper levels of reasoning. This affirms the global criticism of PBL, cautioning against the assumption that PBL is capable of standing on its own; rather, it is effective, if, and only if, there is purposeful instructional design and metacognitive scaffolding (Prosser & Sze, 2014). The most relevant finding from a theoretical point of view was in Cycle II, where full implementation fidelity was accompanied by improvement across all six indicators on Ennis. The achievement of 85% classical mastery indicates that students were provided with sufficient exposure to well-structured PBL environments, fostering the internalization of critical thinking dispositions and cognitive routines. A sociocultural perspective explains this improvement through Vygotsky's Zone of Proximal Development; where, with appropriate scaffolding, students' interactions with peers and teachers enable them to attain higher levels of performance than they would be able to remember on their own (Silalahi, 2019; Topçiu & Myftiu, 2015). PBL conditions, such as cognitive apprenticeships, structured dialogues, and reflective discussions, helped students internalize the reasoning patterns of experts.

Reinforced reasoning and inference skills, with the largest initial gaps, has been noted as the most significant area of contribution for the research study and the critical thinking literature. Critical thinking studies record the gains made in this area, but most do not report the specific, measurable, and cognitive components that do or do not respond positively to an instructional intervention (Yu & Zin, 2023). The gaps in reasoning and inference skills primarily demonstrate the need to undertake more research with students at the elementary level engaged in activities that require the identification of problems, evaluation of evidence, and justification of conclusions. This finding defies the majority of literature that suggests young students are not capable of higher-order reasoning.

From this broader theoretical perspective, the correlation between the refinement of instruction and learning outcomes supports the merit of process-focused research methodologies. Unlike experimental approaches that spell out variables and work with them in isolation and under controlled conditions, CAR provides the opportunity to study the instructional design, classroom setting, and learner processes that evolve in tandem. As with design-based research, CAR adds to the development of theory by providing empirical evidence of the operationalization of various pedagogical strategies within a

given context (Isaacs, 2018; Junedi et al., 2024; Mariyono, 2024; Thu Huong, 2023). In this research study, CAR was not simply a methodological option; it was a way to look at the interplay between cognitive development and instructional changes.

The integration of PBL in Pancasila Education further broadens the global discussion on the application of critical thinking outside of its conventional boundaries in the STEM fields. In value and civics education, the learner is required to be engaged in ethical reasoning, situational appraisal, and reflective choice, which are often the overlooked facets of critical thinking and empirical studies (Facione & Gittens, 2015). PBL, in this case, demonstrates the potential of integrating cognition and civic components of learning by framing critical thinking to social and moral relevance. Hence, it advocates the growing global concerns of education for democratic citizenship and critical thinking for 21st century skills, where the intersection of critical thinking and civic engagement is becoming more pronounced.

This study, on a global scale, makes a contribution to critical thinking scholarship in three ways. It first provides empirical proof of the potential of elementary education level to systematically incorporate the development of critical thinking skills, and this is achievable through appropriate pedagogical design. Second, it shows that PBL, when accompanied by a high level of fidelity and reflective enhancement, encourages not only engagement, but also substantive cognitive change. Lastly, it advocates the use of CAR in attempting to promote theory-based pedagogical innovation, especially in educationally reforming environments, and this is particularly within the domain of developing or low-resource environments.

While the study commendably draws attention to its various contributions, it also details the arguably contextual limitations of the study. As a CAR-based study, and one conducted in an isolated institutional context, the findings do not assert any form of statistical generalizability. Nevertheless, and according to qualitative research, the contextual generalizability, or "soft" transferability in the context of researched frameworks, and analytic generalizability are more valuable (Lincoln & Guba, 1982). The instructional frameworks and learning paths provide educators and researchers alike the contexts and formats to adapt and pilot similar frameworks in different contexts.

Framing the study in the above context, it is clear that the improvement in students' critical thinking skills was an outcome of a deliberate, definable, and positive relationship of learning theory, instructional design, and reflective practice. This study, in its articulation of positioning theory, the theory of critical thinking, the theory of cognitive development, and problem-based theory in pedagogy, is a study that every country in the world should adopt as a best practice. The results of the present study justify and give credence to the emerging international viewpoint on the need for a constructive change in education, emphasizing the need for innovative pedagogical practices.

5. Conclusions

This study provides empirical evidence that the systematic integration of Problem-Based Learning (PBL) within a Classroom Action Research (CAR) framework constitutes an effective and developmentally appropriate strategy for enhancing elementary school students' critical thinking skills in Pancasila Education. By aligning instructional design with learners' cognitive characteristics at the concrete operational stage and embedding authentic problem contexts, the intervention enabled students to progressively internalize

core critical thinking processes, particularly reasoning and inference. These findings reinforce theoretical perspectives that conceptualize critical thinking as a cognitive competence that requires explicit instructional scaffolding and sustained practice, rather than passive exposure to content.

Beyond its instructional implications, this study contributes to the international literature by demonstrating the scholarly value of CAR as a rigorous, process-oriented research approach capable of generating transferable pedagogical insights. The findings extend existing research on PBL by situating critical thinking development within elementary civic education, a domain that integrates cognitive, ethical, and contextual reasoning. While the results do not aim for statistical generalization, they offer analytically generalizable insights that can inform instructional innovation in comparable educational contexts. Future research is encouraged to examine the long-term sustainability of critical thinking gains and to explore the integration of PBL with digital and interdisciplinary learning environments to further advance 21st-century educational competencies.

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