8. Teacher and Student Perceptions of Problem-Based Learning

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Teacher and Student Perceptions of Problem-Based Learning: A Comparative Analysis Across Educational Levels

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ABSTRACT

This study aims to compare the perceptions of Problem-Based Learning (PBL) among teachers and students in elementary, middle, and high schools. Using a mixed-methods approach, surveys and interviews were conducted with 15 teachers and 45 students across various schools. The results indicate that while elementary school teachers and students generally have positive perceptions of PBL, middle school participants report mixed feelings, often citing difficulties in adapting to the new learning style. High school respondents appreciate the depth of understanding fostered by PBL but express concerns about time constraints and curriculum coverage. These findings highlight the need for tailored PBL implementations that consider the specific challenges and advantages at each educational level. This study contributes by providing insights into the practical applications of PBL and suggesting areas for future research to optimize its effectiveness across diverse learning environments.

INTRODUCTION

Problem-Based Learning (PBL) has emerged as a prominent instructional strategy designed to foster critical thinking, problem-solving skills, and student engagement through real-world problem-solving activities. Rooted in constructivist theories of learning, PBL shifts the educational focus from traditional, teacher-centered approaches to student-centered learning environments. This pedagogical model encourages learners to engage actively in their education by addressing complex problems without straightforward

solutions, thereby promoting deeper understanding, critical analysis, and retention of knowledge (Cai et al., 2023; Hastuti et al., 2024). By integrating real-world contexts, PBL not only enhances cognitive development but also nurtures essential 21st-century skills, such as collaboration, communication, and adaptability (Kırkgöz, 2024; Markus Knopfel, Marco Kalz, 2024; Şahin & Kılıç, 2024)

Extensive research has demonstrated the benefits of PBL across various educational settings and disciplines. Studies indicate that PBL can enhance students' critical thinking abilities, improve problem-solving skills, and increase motivation and engagement in the learning process (Id et al., 2024; Tefera et al., 2024). For instance, Kirkg (2024) highlighted that PBL helps students develop self-directed learning skills and the ability to apply knowledge in real-life contexts. Additionally, Romadhon (2024) reported that medical students trained through PBL exhibited superior diagnostic reasoning skills compared to their peers in traditional curricula. These findings underscore the transformative potential of PBL to improve educational practices and learning outcomes across diverse fields.

Despite the documented advantages, research on PBL implementation in K-12 settings remains limited and fragmented. While studies in higher education consistently demonstrate positive outcomes (Id et al., 2024), there is a lack of comprehensive understanding regarding how perceptions of PBL vary among teachers and students across elementary, middle, and high school levels. This knowledge gap is significant because PBL's success relies heavily on the perceptions and readiness of both educators and learners. Negative or ambivalent perceptions may hinder effective implementation, while positive perceptions can enhance the adoption and sustainability of PBL practices (Pikhart, 2020).

Furthermore, challenges in implementing PBL vary according to educational contexts. Teachers may struggle with designing open-ended problems, facilitating student inquiry, and managing the unstructured nature of PBL (Drwish et al., 2023). Similarly, students accustomed to traditional, teacher-led instruction may face difficulties transitioning to a more autonomous learning approach. These barriers are particularly pronounced in younger students who may lack the cognitive and metacognitive maturity required for self-directed learning (Alreshidi & Lally, 2024). Understanding the specific concerns and experiences of teachers and students at different educational levels is crucial for addressing these challenges and refining PBL methodologies to be more effective and accessible.

This study addresses the existing research gap by conducting a comprehensive analysis of teacher and student perceptions of PBL across elementary, middle, and high school levels. By employing a mixed-methods approach that integrates quantitative surveys and qualitative interviews, the research seeks to identify commonalities and distinctions in PBL experiences across educational stages. Specifically, it explores how perceptions influence the effectiveness of PBL implementation and what contextual factors shape these

perceptions. The findings will provide evidence-based insights to guide the development of more tailored and sustainable PBL practices in K-12 education.

The novelty of this study lies in its comparative analysis across three educational levels. While previous research primarily focuses on higher education or specific disciplines, this study offers a broader perspective by capturing the voices of both teachers and students in K-12 settings. By addressing this gap, the study contributes to a more holistic understanding of PBL and its implementation, informing future educational policy and instructional design. Ultimately, the research aims to bridge the divide between PBL theory and practice, ensuring that its benefits are realized across diverse learning environments.

LITERATURE REVIEW

The theoretical foundation of Problem-Based Learning (PBL) can be traced back to the works of John Dewey, who emphasized experiential learning and the value of engaging students in active problem-solving. Building on Dewey's principles, Barrows and Tamblyn (1980) formally introduced PBL in medical education to develop diagnostic reasoning and practical knowledge. Since then, PBL has evolved into a widely adopted instructional approach across multiple disciplines and educational levels.

Several key theoretical frameworks underpin PBL. Constructivist learning theory posits that learners construct knowledge actively rather than passively absorbing information. PBL aligns with this perspective by encouraging inquiry, reflection, and collaboration. Furthermore, the theory of self-directed learning (Knowles) is central to PBL, as it requires learners to take responsibility for identifying learning gaps and seeking information. Research by emphasizes that PBL promotes both cognitive and metacognitive processes, fostering deeper comprehension and long-term retention of knowledge .

Empirical studies support the efficacy of PBL in enhancing academic outcomes and student engagement. For example, a meta-analysis by Zhang (2024) found that PBL improved long-term knowledge retention and problem-solving abilities across various educational contexts. Additionally, research by Amaral (2023) indicates that PBL enhances intrinsic motivation and encourages students to become independent learners. These findings suggest that PBL is not only effective for knowledge acquisition but also for fostering essential skills needed in the modern workforce.

However, the literature also identifies significant challenges associated with PBL implementation. Skliarova (2021) highlighted that many teachers encounter difficulties in designing and facilitating PBL activities due to insufficient training and resources. Furthermore, the transition from traditional to student-centered learning poses challenges for students, especially those unfamiliar with self-directed learning. Maalek (2024) argues that younger learners may lack the metacognitive skills required to navigate open-ended problems independently, creating additional hurdles in elementary and middle school contexts.

A critical gap in the literature concerns the comparative analysis of teacher and student perceptions across educational levels. While extensive research exists on the implementation of PBL in higher education Malek (2024) fewer studies address how PBL is perceived and experienced in K-12 settings. Moreover, existing studies tend to focus on either teacher or student perspectives, rarely integrating both viewpoints to provide a comprehensive understanding (Ohlsaso, 2024). Understanding these perceptions is essential for tailoring PBL methodologies to meet the developmental needs and contextual realities of diverse educational stages.

METHODOLOGY

A mixed-methods approach was chosen for this study to capture both quantitative and qualitative data, providing a comprehensive understanding of the participants' perceptions. This approach allows for the triangulation of data, enhancing the validity and reliability of the findings.

The study involved 600 participants, comprising 15 teachers and 45 students from various schools in Indonesia. The sample was stratified by educational level, with equal representation from elementary, middle, and high schools. Teachers were selected based on their experience with PBL, while students were randomly selected to provide a broad perspective on PBL's impact.

Data were collected using a combination of surveys and semi-structured interviews. The surveys consisted of Likert-scale questions to quantify perceptions of PBL, covering aspects such as engagement, understanding, and challenges. The interviews provided deeper insights into the reasons behind these perceptions and allowed for the exploration of themes not captured by the surveys.

Surveys were administered electronically to ensure wide reach and ease of completion. Interviews were conducted either in person or via video calls, depending on the participants' preferences and availability. All interviews were recorded and transcribed for analysis.

Quantitative data from the surveys were analyzed using descriptive and inferential statistics. Descriptive statistics summarized the general trends in perceptions, while inferential statistics, including ANOVA and t-tests, were used to identify significant differences in perceptions across the three educational levels.

Qualitative data from the interviews were analyzed using thematic analysis. This involved coding the data to identify recurring themes and patterns. The thematic analysis helped to contextualize the quantitative findings and provided a richer understanding of the participants' experiences with PBL.

The mixed-methods approach was selected to leverage the strengths of both quantitative and qualitative research. Surveys provided a broad overview of the participants' perceptions, ensuring that the findings were generalizable across the sample. The use of Likert-scale questions facilitated the quantification of attitudes, allowing for statistical analysis and comparison.

Interviews complemented the surveys by providing depth and context. They enabled the exploration of complex issues and nuanced perspectives that

could not be captured through quantitative measures alone. This dual approach ensured a more holistic understanding of the research problem.

The stratified sampling ensured that all educational levels were adequately represented, allowing for meaningful comparisons. The decision to include both teachers and students provided a comprehensive view of PBL's implementation and impact, capturing insights from those who deliver and those who receive the instruction.

RESEARCH RESULT

Quantitative Findings

The quantitative analysis revealed significant differences in perceptions of PBL among teachers and students across educational levels. Table 1 shows the demographic information of the participants, and Table 2 presents the mean scores for various dimensions of perception, measured on a 5-point Likert scale.

Table 1 Demographic information of the participants

Demographic	Elementary (N=20)	Middle (N=20)	High School (N=20)
Teachers	5	5	5
Students	15	15	15
Gender	60% Female, 40% Male	55% Female, 45% Male	55% Female, 45% Male

Table 2 differences in perception scores

Perception Dimension	Elementary	Middle	High School
Engagement	4.5	3.8	4.0
Understanding	4.6	3.5	4.2
Challenges	3.2	3.9	4.1

ANOVA results indicated significant differences in engagement and understanding perceptions across the three educational levels ($p < 0.01$). Post-hoc tests revealed that elementary students had significantly higher engagement and understanding scores compared to middle school students. This finding underscores the varying levels of receptiveness to PBL among different age groups.

Qualitative Findings

The thematic analysis of interview data revealed three primary themes that aligned with the quantitative findings: Engagement and Motivation, Support and Resources, and Implementation Challenges.

Table 3 summary of the key themes identified from the interviews

Theme	Key Findings	Supporting Quotes
Engagement and Motivation	High engagement levels in elementary; mixed feelings in	"PBL transforms the classroom." (Elem. Teacher)

Theme	Key Findings	Supporting Quotes
	middle school.	"Sometimes I feel lost." (Mid. Student)
Support and Resources	High school teachers report better access to training than others.	"We have regular training." (High School Teacher)
Implementation Challenges	Curriculum constraints hinder effective PBL in middle school.	"It's tough to fit PBL into our packed curriculum." (Mid. Teacher)

Theme 1: Engagement and Motivation

Elementary teachers and students consistently reported high levels of engagement and motivation when participating in PBL activities. For instance, one elementary teacher stated, "PBL transforms the classroom into a dynamic environment where students are excited to learn."

Conversely, middle school participants often expressed mixed feelings. A middle school student noted, "Sometimes it's fun, but other times, I feel lost and overwhelmed with the problems we have to solve."

Theme 2: Support and Resources

Teachers across all levels highlighted the importance of institutional support in implementing PBL. High school teachers reported greater access to professional development resources compared to their middle and elementary counterparts. One high school teacher remarked, "We have regular training sessions that equip us with the skills needed for effective PBL."

Theme 3: Implementation Challenges

All groups identified specific challenges in PBL implementation, but these challenges varied by educational level. Middle school teachers frequently mentioned difficulty in balancing the curriculum's demands with PBL's time-intensive nature. One middle school teacher explained, "It's tough to fit PBL into our packed curriculum. Sometimes we have to rush through it."

DISCUSSION

The findings from this study provide valuable insights into the perceptions of PBL among teachers and students across different educational levels, directly addressing the research questions posed in the introduction.

Understanding Variations in Perceptions

The results indicate that perceptions of PBL vary significantly across educational levels. Elementary school participants reported the highest levels of engagement and understanding, which aligns with previous literature suggesting that younger students often thrive in interactive, hands-on learning environments. This finding supports the idea that PBL can be particularly effective in fostering enthusiasm in younger learners.

In contrast, middle school participants expressed more ambivalence about PBL, highlighting a critical transitional phase in education. The mixed feelings reported by middle school students are consistent with the developmental challenges they face during this stage, including identity formation and increasing academic pressures (Seechaliao, 2017) (Jackson-Triche et al., 2023). These challenges may hinder their ability to fully engage in PBL activities.

High school students demonstrated a more nuanced understanding of PBL, recognizing its potential for deep learning while expressing concerns about time constraints. This reflects a broader trend in high school education, where the emphasis often shifts toward preparing for standardized assessments rather than fostering innovative pedagogical practices (Alam et al., 2023).

Implications for Teacher Training

The thematic analysis revealed a significant need for enhanced support and resources, particularly for elementary and middle school teachers. The discrepancies in access to professional development among the educational levels underscore the necessity for targeted training initiatives. Without adequate support, teachers may struggle to implement PBL effectively, potentially undermining its benefits.

Institutional backing is crucial for successful PBL implementation. Schools should prioritize providing resources and training opportunities that enable teachers to confidently adopt PBL methodologies. As highlighted by (2022), professional development focused on practical strategies can empower teachers to navigate the challenges associated with PBL.

Addressing Implementation Challenges

The identification of implementation challenges across all educational levels emphasizes the need for a more supportive infrastructure. Middle school teachers' concerns about balancing the curriculum with PBL highlight a systemic issue that requires attention. Educational leaders should consider revising curricula to allow for the integration of PBL without compromising essential content delivery.

Collaboration among educators within and across grade levels can foster shared resources and strategies for implementing PBL more effectively. Establishing professional learning communities could provide a platform for teachers to exchange ideas, resources, and best practices, ultimately enhancing PBL's viability in K-12 settings.

CONCLUSIONS AND RECOMMENDATIONS

This study provides a comprehensive analysis of teacher and student perceptions of Problem-Based Learning (PBL) across elementary, middle, and high school levels. The findings reveal that while PBL is widely regarded as an effective instructional strategy for fostering critical thinking, problem-solving skills, and student engagement, its implementation experiences significant variations across educational levels. Elementary school students and teachers generally exhibit a more positive perception of PBL due to its interactive and

exploratory nature. In contrast, middle and high school participants highlight both benefits and challenges, particularly in terms of adapting to self-directed learning and aligning PBL with standardized curricula. One of the key takeaways from this study is that successful PBL implementation depends on factors such as teacher preparedness, institutional support, and students' prior learning experiences. The study underscores the need for targeted professional development programs to equip teachers with the necessary skills to facilitate PBL effectively at different educational levels. Additionally, structured scaffolding mechanisms should be incorporated to assist students in transitioning from traditional learning approaches to more student-centered, inquiry-driven methodologies.

Schools and educational policymakers should provide specialized training and ongoing professional development for teachers to enhance their ability to design, implement, and assess PBL activities effectively. The training should be differentiated based on the educational level to address specific needs and challenges. To mitigate challenges in self-directed learning, particularly for middle and high school students, schools should provide structured guidance, such as mentorship programs, formative assessments, and collaborative learning opportunities, to help students develop the necessary autonomy and problem-solving skills. Effective PBL implementation requires adequate resources, including digital tools, interdisciplinary project frameworks, and access to real-world problem scenarios. Schools should invest in these resources to support engaging and meaningful PBL experiences.

ADVANCED RESEARCH

Future studies should examine the long-term impact of PBL on student academic performance, motivation, and problem-solving abilities. Additionally, cross-cultural research on PBL perceptions may provide deeper insights into the contextual factors that influence its effectiveness.

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