The Influence of Problem-Based Learning Model in teacher Professional Education on Students' Problem Solving Skills

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Abstrak

Problem-Based Learning (PBL) has emerged as an effective pedagogical model in teacher professional education programs (Pendidikan Profesi Guru/PPG) to enhance problem-solving skills among students. This study examines the impact of PBL implementation in PPG on the development of problem-solving abilities in learners. Key findings indicate that PBL fosters critical thinking, collaborative learning, and independent study skills while promoting the practical application of theoretical concepts. Additionally, PBL encourages reflective practices and reduces students' dependency on teachers, enabling them to become self-reliant problem solvers. Recommendations for PPG include integrating simulation-based learning, emphasizing process-oriented assessments, and providing initial mentorship for novice teachers. The study concludes that PBL not only equips future educators with innovative teaching strategies but also positively influences students' cognitive and social skills, making it a vital approach in modern education.

Keywords : Problem-Based Learning, Teacher Professional Education, Problem-Solving Skills, Collaborative Learning, Reflective Practice.

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INTRODUCTION

Problem-solving skills are essential competencies required in the 21st century, as they equip individuals to address complex challenges in various aspects of life. In the context of education, these skills are not only vital for students but also for teachers who play a central role in fostering critical thinking and analytical abilities in their learners. One instructional approach that has gained significant attention for its effectiveness in enhancing problem-solving skills is Problem-Based Learning (PBL). This model shifts the focus from teacher-centered methods to student-centered approaches, allowing learners to actively engage in identifying, analyzing, and solving real-world problems.

Teacher Professional Education Programs (Pendidikan Profesi Guru/PPG) are designed to prepare educators to meet the demands of modern classrooms. These programs aim to develop pedagogical competencies, including the ability to implement innovative teaching models such as PBL. By integrating PBL into PPG, teacher candidates are expected to acquire practical experience in facilitating problem-solving activities that encourage active participation and collaboration among students. This pedagogical shift aligns with the goals of competency-based education, which emphasizes the development of skills applicable to real-life scenarios.

The Problem-Based Learning model emphasizes inquiry, critical thinking, and the application of knowledge to practical situations. Unlike traditional methods that rely heavily on memorization and rote learning, PBL requires students to engage in complex problem-solving processes. Through PBL, learners not only gain content knowledge but also develop essential skills such as teamwork, communication, and self-directed learning. These outcomes are particularly relevant for teacher candidates, as they are expected to implement similar strategies in their classrooms to promote meaningful learning experiences.

Research has shown that PBL positively impacts students' problem-solving skills, fostering deeper understanding and long-term retention of knowledge. However, its implementation in teacher education programs presents unique challenges and opportunities. Teacher candidates must transition from being passive recipients of knowledge to active facilitators of learning, which requires a fundamental shift in mindset and teaching practices. This transformation is critical in preparing educators to effectively address diverse learning needs and cultivate a problem-solving culture in their classrooms.

One of the key advantages of incorporating PBL in PPG is its ability to simulate real-world teaching scenarios. By engaging in problem-based tasks, teacher candidates experience firsthand the complexities of classroom management, student engagement, and curriculum integration. These experiences provide valuable insights into the practical application of theoretical concepts, enabling future teachers to bridge the gap between academic knowledge and classroom practice.

Despite its numerous benefits, the integration of PBL into PPG is not without challenges. Limited resources, insufficient training, and resistance to change are among the common barriers faced by teacher education institutions. Addressing these challenges requires a comprehensive approach that includes professional development for instructors, adequate support systems, and the creation of a collaborative learning environment. By overcoming these obstacles, PPG programs can fully leverage the potential of PBL to enhance the quality of teacher preparation.

The adoption of PBL in teacher education also highlights the need for effective assessment strategies. Traditional evaluation methods may not capture the multifaceted nature of problem-solving skills, necessitating the use of alternative assessment techniques such as performance tasks, self-reflection, and peer evaluation. These approaches provide a more accurate measure of teacher candidates' abilities to implement PBL and foster problem-solving skills in their students.

In conclusion, the integration of Problem-Based Learning into Teacher Professional Education Programs represents a significant step toward improving educational outcomes. By equipping teacher candidates with the knowledge and skills to facilitate problem-solving activities, PBL not only prepares them for the challenges of modern classrooms but also contributes to the development of critical thinking and problem-solving abilities among students. This study aims to explore the impact of PBL on teacher candidates and their future students, providing insights into its potential as a transformative approach in education.

LITERATURE REVIEW

Problem-Based Learning (PBL) originates from constructivist learning theories, particularly those proposed by John Dewey and Lev Vygotsky. Dewey emphasized the importance of experiential learning, where students actively engage with problems to construct knowledge. Vygotsky's theory of social constructivism highlights the role of collaboration and dialogue in learning processes, which are central elements in PBL. In this model, students work in groups to address real-world problems, leveraging prior knowledge and acquiring new insights through inquiry and interaction. The teacher acts as a facilitator, guiding students toward deeper understanding rather than delivering direct instruction.

PBL is characterized by student-centered learning, problem-driven inquiry, and the integration of interdisciplinary knowledge. The learning process typically begins with a complex, open-ended problem that requires students to explore, research, and propose solutions collaboratively. In the context of Teacher Professional Education Programs (PPG), PBL implementation involves creating scenarios relevant to classroom practices, such as lesson planning, student engagement, and assessment strategies. Studies suggest that successful implementation of PBL relies on well-designed problems, structured facilitation, and alignment with learning objectives.

Numerous studies have documented the positive impact of PBL on students' cognitive and social skills. According to Barrows and Tamblyn (1980), PBL enhances critical thinking, problem-solving, and decision-making abilities. Schmidt et al. (2011) found that PBL promotes long-term retention of knowledge and the ability to transfer learning to new contexts. In teacher education, these benefits extend to fostering reflective practices and preparing teacher candidates to design and deliver engaging lessons. Additionally, PBL encourages self-directed learning and improves collaboration skills, both of which are essential for educators.

Integrating PBL into PPG programs equips teacher candidates with innovative pedagogical skills. Savery (2006) emphasizes that PBL aligns with the demands of 21st-century education by preparing teachers to facilitate active, inquiry-based learning. Teacher candidates exposed to PBL are better prepared to foster problem-solving skills in their students and create a dynamic classroom environment. Furthermore, PPG programs that

incorporate PBL provide opportunities for teacher candidates to experience challenges such as student diversity, classroom management, and curriculum integration in a controlled, supportive setting.

Despite its advantages, implementing PBL in teacher education programs faces several challenges. According to Hung et al. (2008), some common barriers include limited access to resources, insufficient training for facilitators, and resistance to shifting from traditional teaching methods. For teacher candidates, transitioning from passive learners to active facilitators of PBL can be daunting. They may require additional support in developing skills such as problem design, scaffolding, and formative assessment. Addressing these challenges involves providing professional development, fostering collaborative environments, and ensuring institutional support.

Assessment in PBL requires approaches that capture the complexity of problem-solving processes. Traditional methods, such as standardized tests, may not adequately measure skills such as critical thinking, collaboration, and creativity. Alternative assessment methods, including performance tasks, peer evaluations, and reflective journals, are recommended to evaluate teacher candidates' ability to implement PBL effectively. Boud and Feletti (1997) argue that assessment in PBL should focus not only on the outcome but also on the learning process, emphasizing the importance of formative feedback and self-reflection.

Research has consistently demonstrated the effectiveness of PBL in enhancing students' problem-solving abilities. A study by Hmelo-Silver (2004) found that students engaged in PBL develop a deeper understanding of content and are more capable of applying knowledge to unfamiliar situations. In the context of teacher education, this translates to teacher candidates being able to design learning experiences that challenge students to think critically and collaboratively. The skills cultivated through PBL, such as adaptability, inquiry, and decision-making, are essential for addressing complex problems in real-world contexts.

While existing literature highlights the benefits and challenges of PBL, there is limited research on its long-term impact on teacher candidates' professional development and their ability to implement PBL in actual classrooms. Furthermore, few studies explore the specific strategies required to overcome barriers in integrating PBL into PPG programs. This study aims to address these gaps by examining the influence of PBL on teacher candidates and their subsequent impact on students' problem-solving skills. By doing so, it seeks to provide actionable insights for enhancing the quality of teacher education.

METHODOLOGY

This study employs a mixed-methods approach, combining qualitative and quantitative methodologies to comprehensively examine the impact of Problem-Based Learning (PBL) on teacher candidates in Teacher Professional Education Programs (PPG) and its subsequent influence on students' problem-solving skills. The research design involves both experimental and descriptive components to capture measurable outcomes and participants' experiences. The study involves 60 teacher candidates enrolled in a PPG program at a university in Indonesia and 120 secondary school students. The teacher candidates are divided into two groups: the experimental group, consisting of 30 participants trained using the PBL approach, and the control group, comprising 30 participants trained using traditional teaching methods. Similarly,

the secondary school students are also divided into two groups, with 60 students taught by teacher candidates using the PBL approach and 60 students taught by teacher candidates using traditional methods.

The study is conducted in two phases. In the first phase, the teacher training phase, the experimental group undergoes workshops and practice sessions focused on implementing PBL in classroom settings, while the control group receives training in traditional teaching methods. In the second phase, the teaching practicum phase, teacher candidates from both groups teach a specific topic to their assigned secondary school students over six weeks, with the experimental group applying PBL techniques and the control group employing conventional teaching methods. Data collection combines quantitative and qualitative tools. Quantitative instruments include pre- and post-tests administered to secondary school students to measure changes in their problem-solving skills and rubrics used to assess teacher candidates' ability to design and implement PBL strategies. Qualitative instruments involve classroom observations to analyze teaching practices and student engagement, semi-structured interviews with teacher candidates and students to explore their experiences, and reflective journals maintained by teacher candidates to document their teaching challenges and learning experiences.

Data analysis involves both quantitative and qualitative methods. Pre- and post-test scores are analyzed using paired sample t-tests and ANCOVA to evaluate the effectiveness of PBL in improving students' problem-solving skills, while descriptive statistics assess the performance of teacher candidates in applying PBL strategies. Classroom observations, interviews, and reflective journals are analyzed using thematic analysis to identify patterns and themes related to the implementation of PBL and its impact on teaching and learning processes. Ethical considerations are carefully addressed, with informed consent obtained from all participants, confidentiality and anonymity maintained, and the research protocol approved by the university's ethics committee.

The study acknowledges potential limitations, such as variations in teaching environments, individual differences among teacher candidates, and the relatively short duration of the classroom implementation phase. These limitations are mitigated through data triangulation from multiple sources and consistent monitoring across groups. This methodology aims to provide a comprehensive understanding of the effectiveness of PBL in PPG programs and its influence on students' problem-solving skills, offering actionable insights for teacher education improvements.

RESULTS AND DISCUSSION

The findings of this study are presented in two main areas: quantitative results measuring the impact of Problem-Based Learning (PBL) on students' problem-solving skills and qualitative insights from teacher candidates' experiences and classroom observations.

Quantitative analysis of pre- and post-test scores revealed significant improvements in students' problem-solving skills in the PBL group compared to the traditional method group. Students taught by teacher candidates trained in PBL demonstrated a mean score increase of 35%, while the traditional group showed an increase of only 12%. Statistical analysis using ANCOVA confirmed the significant difference between the two groups ($p < 0.01$). Additionally, teacher candidates in the experimental group outperformed

their counterparts in designing and implementing PBL strategies, scoring an average of 4.3 on a 5-point scale compared to 3.1 in the control group.

Qualitative data from classroom observations and reflective journals provided deeper insights into the teaching and learning dynamics. Observations showed that PBL classrooms were more dynamic and interactive, with students actively engaging in group discussions, collaborating effectively, and demonstrating critical thinking skills. Conversely, traditional classrooms showed limited student participation, with teacher-centered instruction dominating the sessions. Teacher candidates in the PBL group noted that the approach enhanced their facilitation skills and increased student engagement, although some reported initial difficulties transitioning from being direct instructors to facilitators.

Reflective journals further highlighted challenges faced by teacher candidates in the experimental group, such as designing meaningful, open-ended problems and managing group dynamics to ensure equitable participation. Despite these challenges, they found the experience rewarding, as it encouraged innovative problem-solving and deeper engagement with the material. Interviews with students reinforced these findings, with those in the PBL group expressing greater motivation and a stronger connection to the learning material compared to those in traditional classrooms.

These results align with previous research that highlights the effectiveness of PBL in fostering critical thinking, collaboration, and the practical application of knowledge. The study confirms that PBL not only improves students' problem-solving skills but also equips teacher candidates with the pedagogical skills necessary for 21st-century classrooms. Furthermore, the findings underscore the importance of providing adequate training and institutional support to overcome challenges in PBL implementation, such as problem design and group management.

In conclusion, the study demonstrates the transformative potential of PBL in teacher professional education. By preparing teacher candidates to adopt innovative teaching approaches, PBL enhances the quality of instruction and creates more engaging, student-centered learning environments. However, to maximize its effectiveness, PPG programs must address the identified challenges through structured workshops, mentorship, and access to resources. With these measures in place, PBL can significantly contribute to the development of critical thinking and problem-solving skills in both teacher candidates and their students.

CONCLUSION

This study concludes that Problem-Based Learning (PBL) significantly enhances both teacher candidates' pedagogical competencies and students' problem-solving abilities. Teacher candidates trained in PBL demonstrated superior skills in designing learning activities, facilitating student-centered discussions, and assessing student progress. These competencies translated into classroom environments that were more interactive, engaging, and conducive to the development of critical thinking and collaborative skills among students.

Quantitative findings revealed a substantial improvement in students' problem-solving skills in PBL classrooms, with significant increases in test scores compared to those in traditional classrooms. This improvement underscores the effectiveness of PBL in fostering higher-order thinking skills, such as critical reasoning, creativity, and

decision-making. Qualitative data from classroom observations, interviews, and reflective journals further highlighted the transformative impact of PBL on teaching practices and classroom dynamics. Teacher candidates reported gaining confidence in facilitating learning and noted that PBL encouraged active student participation and deeper engagement with the subject matter.

Despite its numerous benefits, the study also identified challenges in implementing PBL, particularly in designing complex, meaningful problems and managing diverse student interactions. These challenges indicate the need for comprehensive training and continuous support for teacher candidates to ensure successful implementation. Providing structured workshops, mentorship, and resources can address these issues and enhance the effectiveness of PBL integration in Teacher Professional Education Programs (PPG).

The findings emphasize the importance of incorporating PBL into PPG programs to prepare educators for the demands of modern education. By equipping teacher candidates with innovative pedagogical approaches, PPG programs can create learning environments that nurture critical thinkers and problem solvers. While PBL presents certain challenges, its benefits far outweigh its limitations. With adequate planning, training, and institutional support, PBL can become a powerful tool in shaping future educators and enhancing students' problem-solving skills, ultimately contributing to the advancement of education in a rapidly changing world.

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