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Assessing the Effectiveness of the Problem-Based Learning (PBL) Model Across Study Programs on Students at Yogyakarta State University

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ABSTRACT

Student learning outcomes are key indicators of educational quality and remain a primary focus in education systems globally. Problem-Based Learning (PBL) is recognized as an instructional model that fosters active learning, critical thinking, and real-world problem-solving. This study investigates the effectiveness of PBL in improving student learning outcomes at Yogyakarta State University across several academic programs. The study employs a Quasi-Experimental design using a One-Group Pre-test–Post-test approach. PBL was implemented in classes from three study programs: Economics Education, Management, and Office Administration Education. Cognitive learning outcomes were measured before and after the intervention to evaluate the impact of PBL. The analysis shows significant improvements in student cognitive achievement following the implementation of PBL. Students demonstrated higher levels of understanding and problem-solving abilities after participating in PBL sessions, indicating a positive learning effect across all involved programs. PBL effectively enhances student learning outcomes and supports the development of critical thinking skills. Its successful application across multiple disciplines at Yogyakarta State University highlights the model's potential to improve overall educational quality. The findings reinforce PBL as a valuable pedagogical approach for modern higher education.

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1. INTRODUCTION

Student learning outcomes are a longstanding issue in education that continues to affect educational systems worldwide. Despite numerous efforts to improve the quality of education,

disparities in student performance persist across different schools, programs, and regions. Learning outcomes are a crucial indicator of educational quality, as they reflect the extent to which students acquire the knowledge and skills necessary for their academic and professional development. Therefore, improving learning outcomes remains a central focus for educators and policymakers alike (Li & Wang, 2022).

Recent studies have explored various factors contributing to the variation in student learning outcomes, including teaching methods, student engagement, and environmental factors (Lee et al., 2021). Traditional, teacher-centered teaching approaches, where students are mainly passive recipients of knowledge, have been shown to be less effective in fostering critical thinking and problem-solving skills, which are essential for success in the 21st century (Wang & Chen, 2021). As educational demands shift toward skills such as creativity, collaboration, and analytical thinking, there is an increasing need to adopt instructional models that actively engage students and develop these competencies (Shen et al., 2023) (Shen et al., 2023). Learning outcomes refer to students' achievements after a prolonged learning process. Bloom, (1956) explains that learning outcomes can encompass various sensory aspects, such as knowledge (cognitive), skills (psychomotor), and attitudes (affective).

Learning outcomes are often explained through educational theories, such as Bloom's taxonomy, which discusses three domains of learning: cognitive, affective, and psychomotor. Research measuring learning outcomes typically employs quantitative or qualitative methods, such as surveys, experiments, or case studies, to identify the impact of learning strategies on academic achievement (Gagne & Briggs, n.d.). National curricula, guidelines, or educational policies are often used as references in determining learning outcomes, such as the Learning Outcomes Framework or Graduate Competency Standards (SKL) (Kementerian Pendidikan, 2016).

Practical research documenting learning outcomes is conducted through applying specific teaching strategies in the classroom, such as active learning, learning media, or evaluation methods (Jones, 2020). One promising solution to learning outcomes is the implementation of more active, student-centered teaching methods. Among these methods, Problem-Based Learning (PBL) has emerged as an effective strategy for enhancing learning outcomes. PBL emphasizes the use of real-world problems as a starting point for learning, encouraging students to engage actively with the material. This approach fosters deeper understanding, critical thinking, and collaboration, all of which are key components of a successful learning experience (Roschelle et al., 2021).

Recent research has confirmed that PBL not only improves cognitive learning outcomes but also enhances non-cognitive outcomes such as communication, collaboration, and problem-solving skills. Studies indicate that PBL helps students apply theoretical knowledge to practical situations, which enhances their ability to retain information and engage in meaningful learning experiences (Yoo & Lee, 2022). Furthermore, by connecting academic knowledge to real-world situations, PBL increases the relevance of the content, which in turn motivates students and improves their overall academic performance (Nguyen et al., 2023).

Although numerous studies have demonstrated the effectiveness of Problem-Based Learning (PBL) in improving cognitive and non-cognitive learning outcomes, most of these studies were conducted in different educational contexts and have not specifically examined its application at Yogyakarta State University. Existing research also tends to focus on single courses or study programs, leaving a gap in understanding how PBL performs across multiple academic programs within the same institution. Moreover, limited empirical evidence exists regarding the comprehensive impact of PBL on both cognitive and non-cognitive learning outcomes in the context of Indonesian higher education. Therefore, a systematic investigation of PBL implementation at Yogyakarta State University is needed to provide local evidence on

its effectiveness and to address persistent issues related to variations in student learning outcomes.

Recent research has confirmed that PBL not only improves cognitive learning outcomes but also enhances non-cognitive outcomes such as communication, collaboration, and problem-solving skills. Studies indicate that PBL fosters deeper engagement with course content, which increases students' ability to retain and apply knowledge (Zainuddin et al., 2021). This shift from passive learning to active engagement allows students to take ownership of their learning process, which leads to higher levels of motivation and perseverance (Srisawasdi et al., 2022). In addition to improving academic performance, PBL offers a unique opportunity for students to develop essential life skills that are highly valued in both academic and professional environments. For instance, in PBL environments, students work in teams to tackle real-world problems, fostering a sense of collaboration and interdependence. This collaborative aspect is critical as students learn how to work effectively with diverse groups, manage conflicts, and communicate complex ideas clearly (Savery, 2021). Furthermore, PBL encourages self-directed learning, as students are required to take responsibility for their learning journey, researching information independently, and applying their findings to the problem at hand. This autonomy builds the confidence and critical thinking necessary for lifelong learning (Brahim et al., 2023). An important characteristic of PBL is its focus on inquiry-based learning, where students engage in active problem-solving rather than passively receiving information. By posing open-ended questions and presenting students with complex, real-world scenarios, PBL challenges them to think critically and apply their knowledge in dynamic, often ambiguous, contexts. This prepares them to deal with challenges they will encounter in professional life, where solutions are not always straightforward and require a multi-disciplinary approach (Chung et al., 2020). Research supports the idea that students exposed to PBL develop stronger problem-solving skills and are better equipped to handle uncertainty and complexity (Zainuddin & Halili, 2020). Moreover, studies have found that PBL enhances the development of soft skills such as communication and teamwork. These skills are increasingly recognized as crucial for success in the 21st century workplace, where employers are looking for individuals who can collaborate with others, think critically, and adapt to changing environments (Edgar et al., 2022). By integrating these soft skills into the learning process, PBL offers a holistic approach to education, which aligns with the evolving needs of the labor market.

While PBL offers numerous benefits, it is not without its challenges. Successful implementation of PBL requires careful planning and a supportive learning environment. Teachers must facilitate the learning process, guiding students through the complexities of the problem while allowing them the freedom to explore and make decisions. Additionally, some students may find the transition from traditional learning models to PBL difficult, especially if they are used to more structured, teacher-led environments (Brahim et al., 2023). Therefore, continuous professional development for educators and tailored support for students is necessary to maximize the effectiveness of PBL.

Furthermore, the relevance of PBL in today's education landscape lies in its ability to connect academic knowledge to real-world situations. This approach not only increases the engagement of students but also helps them understand how theoretical knowledge can be applied to practical challenges (Chung et al., 2020). As the demands of the workforce evolve, there is a growing emphasis on skills such as creativity, critical thinking, and collaboration—skills that are integral to the PBL model. Research shows that students who participate in PBL are better equipped to navigate the complexities and uncertainties of the modern world, as they are trained to think critically, work collaboratively, and solve problems creatively (Brahim et al., 2023).

This study aims to assess the effectiveness of the PBL model in improving student learning outcomes at Universitas Negeri Yogyakarta. By exploring how PBL is implemented across different academic programs, this research seeks to uncover its impact on students' cognitive and non-cognitive outcomes, engagement, and overall learning satisfaction. The findings will contribute to the ongoing conversation about how to improve educational practices and outcomes, offering valuable insights for educators and policymakers seeking to optimize teaching strategies in higher education.

2. METHOD

This study employs the One-Group Pre-test Post-test design, a type of quasi-experimental research that involves a single group of subjects. In this design, the variables to be analyzed are measured both before and after the intervention or treatment is applied. This design is commonly used when the use of a control group is not practical (Campbell & Stanley, 1963). Steps in the One-Group Pre-test Post-test Design

Pre-test: At this stage, an initial measurement of the variable to be studied is taken before the intervention is applied (Fraenkel et al., 2012). For example, in educational research, a pre-test is used to assess students' proficiency in a subject before any specific treatment is given. **Treatment Implementation:** After the pre-test, the intervention or treatment is applied to the group (Gay et al., 2011). This intervention may involve applying a particular teaching method, conducting training, or testing another technique whose effectiveness is being evaluated.

Post-test: Once the intervention is completed, a follow-up measurement is conducted to determine if there were any changes in the variables of interest. The post-test results are compared with the pre-test results to evaluate the impact of the treatment (Creswell, 2012). The population of this study consisted of 163 students at Yogyakarta State University, drawn from three classes representing different academic programs. Specifically, 54 students were from the Economics Education program, 54 students from the Management program, and 55 students from the Office Administration program. The sample in this study comprised the entire population, as all members of the population were included as research subjects

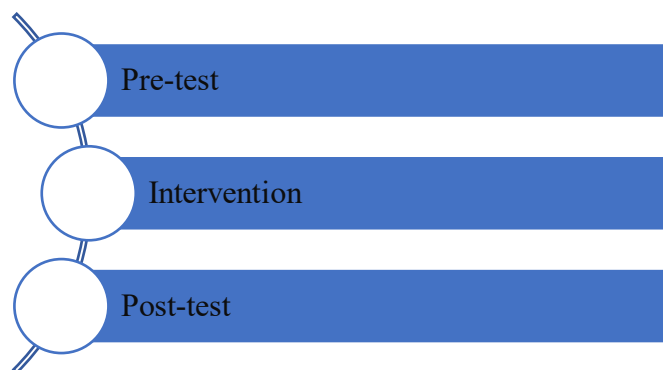


Figure 1. Design Flow Pre-test → Intervention → Post-test

The primary advantage of this design is its simplicity and the fact that it does not require a control group, which makes it more feasible in situations where resources are limited test within the same group, assuming that the data follows a normal distribution (Fraenkel et al., 2012). The data analysis technique employed in this study is the Paired t-test, a statistical method used to compare the means of two related (paired) data sets, such as data collected

before and after a treatment within the same group. The purpose of this test is to determine whether there is a significant difference between the two measurements.

3. RESULTS AND DISCUSSION

3.1 Results

The research findings will provide a clear and comprehensive depiction of the average (mean) scores before and after the intervention for the study programs of Economics Education, Management, and Administration Education.

The results of the study on the effectiveness of the Problem-Based Learning (PBL) model are presented in a comprehensive manner, first analyzing each study program individually and then making cross-program comparisons. The overall analysis of the study programs—Economics Education, Management, and Office Administration Education—was conducted using SPSS 20. The average student scores, before and after the PBL intervention (implementation of PBL in the classroom), are shown in Tables 1 below :

Table 1. Paired Samples Statistics

		Paired Samples Statistics			
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	79.9874	159	9.84499	.78076
	Posttest	90.0377	159	9.23182	.73213

According to the overall analysis presented in Tables 1 and 2, the significance value of 0.000 suggests a statistically significant difference between the learning outcomes before and after the intervention (the implementation of the PBL model). The average learning outcome before the intervention was 79.9874, while it increased to 90.03777 after the intervention, reflecting an improvement of 11.1623% in the average learning outcomes. Thus, it can be concluded that the PBL (Problem-Based Learning) model effectively enhances learning outcomes across various study programs, including Education Economics, Management, and Office Administration Education. The significance levels for these programs can be found in Table 2 below. The separate analysis for the Education Economics, Management, and Office Administration Education programs is as follows:

The implementation of PBL in the Education Economics program has also been shown to have a significant effect on improving students' learning outcomes in the introductory accounting course. The mean scores before and after the intervention reveal a significant increase, with the learning outcomes rising from 83.1509 to 91.7547 (see Table 2). The significance value of 0.000 indicates a statistically significant difference between the pre-treatment and post-treatment results. Thus, it can be concluded that the PBL (Problem-Based Learning) model has a significant impact on enhancing the learning outcomes of students in the Education Economics program, particularly in the introductory accounting course.

Table 2. Paired Samples Statistics

		Paired Samples Statistics			
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	83.1509	53	7.31541	1.00485
	Posttest	91.7547	53	7.15463	.98276

The implementation of PBL in the Management program has also been found to have a significant effect on improving students' learning outcomes in the introductory accounting course. The mean scores before and after the intervention indicate a noticeable increase, with learning outcomes rising from 81.8333 to 92.2292 (see Table 5). The significance level of 0.000 (see Table 3) suggests a statistically significant difference between the results before and after the intervention. Therefore, it can be concluded that the PBL (Problem-Based Learning) model has a significant impact on enhancing the learning outcomes of students in the Management program, particularly in the introductory accounting course.

Table 3. Paired Samples Statistics

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	81.8333	48	6.99037	1.00897
	Posttest	92.2292	48	5.82087	.84017

The implementation of PBL in the Office Administration Education program has also been found to significantly enhance student learning outcomes in the introductory accounting course. The mean scores before and after the intervention show a substantial increase, with learning outcomes rising from 75.5690 to 86.6552 (see Table 4). The significance value of 0.000 indicates a statistically significant difference between the pre-treatment and post-treatment results. Thus, it can be concluded that the PBL (Problem-Based Learning) model has a considerable impact on improving the learning outcomes of students in the Office Administration Education program, particularly in the introductory accounting course.

Tabel 4. Paired Samples Statistics

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	75.5690	58	12.14548	1.59478
	Posttest	86.6552	58	11.96567	1.57117

The comparison of the average learning outcome improvements across different study programs can be observed in the following table:

Table 5. Comparison of the Three Study Programs

Program					Pre-test Score	Post-test Score	Improvement (%)
Overall (Economic Education, Management, Office Administration Education)					79,987	90,0377	11,1623%
Economic Education					83,150	91,7547	9,3769%
Management					81,833	92,2229	11,2657%
Office Administration Education					75,569	86,6552	12, 7934%

3.2 Discussion

Why PBL Proven to Enhance Learning Outcomes? Problem-Based Learning (PBL) enhances learning outcomes because it is a teaching model that emphasizes the use of real-world problems as a starting point for the learning process. PBL encourages students to actively seek solutions to the challenges they encounter, which not only increases their understanding of the material but also fosters critical and creative thinking skills. This is supported by the research of Barrows & Tamblyn, (1980) which shows that PBL aids students not only in acquiring

knowledge but also in developing better problem-solving skills. Further research by Hmelo-Silver, (2004) also supports these findings, demonstrating that PBL enhances critical thinking skills in medical education. In the context of higher education, Thomas, (2000) reviewed various studies and found that PBL improves collaborative skills, communication, and critical thinking skills, all of which contribute to better learning outcomes. Therefore, PBL has been proven to be effective in enhancing both the quality of learning and the relevant skills for students. More specifically, the Problem-Based Learning (PBL) model has the following characteristics:

First, Enhanced Concept Understanding: In PBL, students do not merely passively learn theories, but they are actively engaged in the process of exploring and applying relevant concepts to the problem at hand. This helps them integrate new knowledge with existing knowledge, leading to a deeper understanding. This is consistent with the research by Savery, (2021), which explains that PBL enhances conceptual understanding by encouraging students to engage in problem-solving that requires the direct application of their knowledge. This process not only improves theoretical understanding but also enhances analytical and critical thinking abilities, which positively impacts student learning outcomes. Vaughan, (2010) found that PBL has a positive impact on students' understanding of concepts. By involving students in real-world situations, they can integrate their acquired knowledge into a broader context, deepening their understanding and improving learning outcomes. Liu & Chen, (2010), in their research on PBL in engineering education, found that PBL helps students develop a better understanding of technical concepts that were previously difficult to grasp through traditional methods. This research indicates that the implementation of PBL can improve students' understanding and learning outcomes across various disciplines.

Second, Development of Cognitive and Critical Skills: PBL encourages students to think critically and analytically. They need to identify problems, gather information, analyze data, and make decisions based on relevant evidence. These skills are essential not only in academic contexts but also in real life. PBL helps students become more engaged in deep thinking, sharpening their cognitive skills and improving their ability to think analytically in complex situations. Koh & Khine, (2006) explained in their book that PBL fosters the development of critical thinking skills by challenging students to think analytically and reflectively. PBL provides students with the opportunity to question their assumptions, evaluate evidence, and develop solutions based on deep critical thinking. Through group discussions and problem exploration, students develop better analysis and problem-solving skills compared to traditional learning models (Liu & Chen, 2010). Savin-Baden, (2007) also highlights in her book that PBL enhances critical thinking skills by prompting students to think analytically and reflectively, enabling them to challenge assumptions, assess evidence, and develop well-founded solutions.

Third, Collaboration and Social Skills: PBL is often carried out in groups, which enhances students' collaboration skills. Group work teaches students to cooperate, share ideas, and provide feedback to each other. This helps them develop communication and problem-solving skills within a social context. Johnson & Johnson, (1994) in their research on cooperative learning demonstrated that PBL enhances collaboration among students. This learning model encourages students to work together in groups to solve problems, leading to improved social skills such as communication, negotiation, and teamwork. Similarly, Leung & Kember, (2003) found that PBL enhances students' social skills through group interactions. In the PBL model, students are required to collaborate in solving problems, fostering essential communication and teamwork skills needed in professional and social life. This research shows that PBL not only improves academic outcomes but also essential social skills. PBL strengthens students' social skills through group tasks that demand active communication and shared

responsibility. In PBL groups, students often collaborate to reach a common solution, which builds skills such as leadership, conflict management, and effective collaboration. This research demonstrates that PBL is an effective method for facilitating the development of social and collaborative skills (Thomas, 2000)

Fourth, Application of Knowledge in Real-World Situations: PBL often involves problems that are relevant to real-life situations or professions, making learning more contextual and applicable. Students are more motivated to learn because they see the relevance of the material to the challenges they face outside the classroom. Norman & Schmidt, (1992) found that PBL is effective in enhancing students' ability to apply the knowledge they have learned to real-world situations. By confronting problems that are relevant to real life, students can integrate the theories they have learned with actual practice, thereby deepening their understanding and skills in solving professional problems. Students who engage in PBL are better able to relate their academic knowledge to the challenges they face in the field (Duch et al., 2001). Hmelo-Silver, (2004) in her research on the effects of PBL in medical education revealed that students involved in PBL are better able to apply theory in real-world contexts. By working on real or relevant cases, students not only learn to recall information but also learn to solve problems in practical, applicable ways.

In conclusion, Problem-Based Learning has proven to be an effective approach for enhancing both cognitive and non-cognitive learning outcomes. By fostering active engagement, critical thinking, problem-solving, and teamwork, PBL not only improves academic performance but also equips students with the skills necessary to succeed in the modern workforce. However, its successful implementation requires a thoughtful approach to teaching, sufficient resources, and ongoing support for both students and educators.

4. CONCLUSION

The article assesses the effectiveness of the Problem-Based Learning (PBL) model in improving student learning outcomes across three academic programs—Economics Education, Management, and Office Administration Education—at Universitas Negeri Yogyakarta using a quasi-experimental one-group pre-test and post-test design, the study revealed significant improvements in learning outcomes post-intervention. Overall Improvement: The average score increased by approximately 11.16% across all programs. Program-Specific Gains: Economics Education: From 83.15 to 91.75 (9.38% improvement). Management: From 81.83 to 92.23 (11.27% improvement). Office Administration Education: From 75.57 to 86.66 (12.79% improvement). The study emphasizes PBL's capacity to enhance not only cognitive outcomes, such as critical thinking and problem-solving skills, but also non-cognitive skills, including collaboration and communication. Despite its benefits, successful PBL implementation requires careful planning, teacher facilitation, and student support. These findings contribute to the ongoing discussion on adopting active, student-centered learning strategies to improve higher education outcomes.

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