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Research Trends in Problem-Based Learning: A Narrative Review of Studies on Students' Engagement

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Abstract

Problem-Based Learning (PBL) is widely recognized as an instructional approach that encourages active learning, critical thinking, collaboration, and meaningful student participation. Although many previous studies have examined the effectiveness of PBL in improving academic achievement, relatively fewer studies have specifically discussed how PBL influences students' engagement throughout the learning process. Therefore, this study aims to analyze the development of research on PBL related to students' engagement during the 2016–2025 period. This study applies a narrative review method by examining open-access journal articles that are relevant to the topic. The analysis focuses on research trends, methodological approaches, engagement dimensions, and key findings reported in previous studies. The findings show that research on PBL has increased over the last decade and has gradually shifted toward a broader discussion of students' behavioral, emotional, and cognitive engagement. The most frequently used research methods include quasi-experimental design, classroom action research, and mixed-method approaches. Overall, PBL has been proven effective in increasing students' active participation, learning motivation, collaboration, problem-solving ability, and conceptual understanding. However, several challenges remain in its implementation, including limited learning time, unequal student participation, teachers' readiness, and the need for appropriate problem design. This review indicates that PBL is not only relevant for improving learning outcomes but also plays an important role in strengthening students' engagement in the learning process. Future studies are recommended to explore PBL implementation across different educational levels, subjects, and learning contexts, especially in technology-supported, interdisciplinary, and inclusive classroom environments that require sustained participation and reflective learning over time.

Keywords: Problem-Based Learning, Students' Engagement, Active, Passive, Learning Methods.

1. Introduction

Education now places greater emphasis on active learning, where student engagement is a key indicator of the success of the learning process. Student engagement in the classroom is defined as multidimensional engagement (cognitive, emotional, and behavioural) that drives student motivation and academic achievement. Problem-Based Learning (PBL) is a learning model in which students are the focus of the learning process, using real-world problems as triggers for learning. This learning model encourages students to actively seek information, engage in discussion, and build their understanding independently and collaboratively. Problem-Based Learning (PBL) has emerged as a key strategy in line with the paradigm of authentic problem solving to build knowledge (Zhong et al., 2025). This approach is highly relevant in today's digital age because it effectively bridges theory and practice. Problem-Based Learning is designed to develop students' critical thinking skills through a structured problem-solving process based on group discussions. This learning model can encourage deep learning, where students not only receive the information presented, but also analyse and reflect on solutions to the problems given.

The development of PBL research cannot be separated from the increasing attention to the concept of student engagement in the learning process. Student engagement is an important factor that contributes to academic success and the quality of the student learning experience. Behavioural engagement reflects student participation during learning activities, emotional engagement reflects student interest and enthusiasm, while cognitive engagement encompasses students' mental effort in understanding and applying learning concepts (Yew & Goh, 2016). The division of student engagement into behavioural, emotional, and cognitive dimensions shows that student engagement is not merely physical presence but also reflects student participation and thinking in building understanding. The implementation of Problem-Based Learning can enhance students' learning

activities in the classroom. Research by (Widiastuti et al., 2024) shows that the use of PBL combined with learning media can increase students' engagement, particularly in discussion and problem-solving activities, which are key indicators of students' engagement. When students find it easier to understand the context of a problem, they become more confident in participating in discussions and expressing their opinions.

Since 2016, several empirical studies have explored the relationship between PBL and student engagement in various classroom contexts and learning materials. PBL research on student engagement shows that PBL increases intrinsic motivation, especially in the fields of built environment and EFL. A review from 2010-2024 has confirmed that PBL is more effective in reducing achievement gaps and preparing students to face challenges professionally (Kaur & O'grady, 2024). From this review, Problem Based Learning is not only effective in increasing student engagement and learning achievement, but also able to prepare students to face the demands of the professional world, even though there are still challenges in its implementation. Similarly, an experimental case study of elementary school students by (Anugraheni et al., 2026) showed that PBL significantly increased students' behavioural and emotional engagement in mathematics learning, as measured by a validated engagement scale across all three dimensions of engagement. The implementation of structured PBL can create a more interactive and meaningful learning environment for students, so that students are not only active in participating in class but also show high interest and enthusiasm for the learning process. Other research in the context of science education shows that the use of problem-based learning combined with learning media or activities can increase student participation in discussions and problem solving, resulting in greater student engagement compared to conventional learning methods (Manalu et al., 2024). The implementation of PBL also successfully increased students' engagement when combined with other approaches such as Culturally Responsive Teaching (CRT) (Maulidiana Hidayati, Eka Junaidi, 2024). This suggests that when learning is tailored to student's backgrounds and experiences, they tend to feel more connected to the material being studied and are therefore more motivated to actively participate, both in discussions and in completing assigned tasks. In classroom action research by (Rosyida et al., 2024) found that the implementation of PBL significantly enhanced students' learning activities through a learning process that involved group discussions, observations, and ongoing reflection. Through this series of activities, students not only become more active but also gain a deeper understanding of the material. Research by (Jothy et al., 2024) shows that the implementation of PBL can enhance motivation to learn, as evidenced by increased attention, enthusiasm, and engagement during the learning process. The curiosity that arises during the learning process also helps students stay focused and enthusiastic throughout the lesson, from start to finish.

In terms of publication trends, PBL research patterns have also evolved significantly in recent years, with an increasing number of articles focusing on student experiences and students' engagement in problem-based learning. Although much evidence points to the positive impact of PBL on engagement, most studies remain limited to specific contexts or employ restricted research designs. This highlights the need for a review of the development of PBL research related to student's engagement from 2016 to 2025. Based on this background, this study aims to analyse trends in research on Problem-Based Learning (PBL) related to students' engagement during the 2016-2025 period. Specifically, this study is aimed at how research on PBL has related to students' engagement evolved during the 2016-2025 period, identify the research methods most used in studies related to PBL and student engagement, identify the key findings and research trends can be identified from previous studies. Through a comprehensive literature review, this study is expected to provide a clearer picture of the direction of PBL research and serve as a foundation for future research focused on enhancing students' engagement in learning.

Education today requires learning approaches that place students as active participants rather than passive recipients of information. In this context, student engagement has become an important indicator of learning quality because it reflects how far students are involved behaviorally, emotionally, and cognitively during activities. Behavioral engagement can be seen from students' participation, discussion, and task completion. Emotional engagement appears through students' interest, enthusiasm, confidence, and responses toward learning. Meanwhile, cognitive engagement refers to students' effort in understanding concepts, solving problems, connecting ideas, and reflecting on what they have learned. These three dimensions show that engagement is not limited to physical presence in the classroom, but also includes students' willingness to think deeply and participate meaningfully.

Problem-Based Learning (PBL) is one of the instructional models related to active learning and student engagement. PBL uses real or contextual problems as the starting point of learning, so students are encouraged to investigate, discuss, collaborate, and construct knowledge through problem-solving activities. Through this model, students do not only listen to explanations from the teacher, but also take part in identifying problems, searching for information, proposing solutions, and presenting their ideas. This process can strengthen students'

critical thinking, communication, collaboration, and self-directed learning skills. Therefore, PBL is relevant to current needs, especially in preparing students to face problems in academic, social, and professional contexts.

The development of PBL research from 2016 to 2025 shows that this learning model continues to receive attention in various fields. Earlier studies often emphasized the relationship between PBL and students' learning outcomes, such as achievement, conceptual understanding, and problem-solving ability. However, recent studies have begun to give attention to students' engagement as an important part of the learning process. This shift is significant because high learning outcomes cannot be separated from the quality of students' participation during learning. Students who are involved in discussion, emotionally interested in the lesson, and cognitively willing to analyze problems tend to develop deeper understanding than students who only memorize information.

Several studies show that PBL can improve students' behavioral engagement by encouraging them to participate more actively in classroom activities. In PBL, students are usually required to work in groups, ask questions, discuss possible answers, and complete tasks based on the problems given. These activities create opportunities for students to interact with peers and teachers. As a result, students become more involved in the learning process. In addition, PBL can improve emotional engagement because the problems used in learning are often related to real-life situations. When students feel that the material is relevant to their experiences, they tend to be more interested, motivated, and confident in expressing opinions.

PBL also contributes to cognitive engagement. Through problem-solving activities, students are encouraged to analyze information, compare ideas, evaluate possible solutions, and reflect on their learning process. This makes learning more meaningful because students are not only asked to remember facts, but also to use knowledge in solving authentic problems. In science, mathematics, language learning, and social studies, PBL has been reported to help students understand concepts deeply because they are involved in constructing meaning. This shows that PBL supports deep learning, especially when teachers provide guidance, appropriate problems, and opportunities for reflection.

In terms of research methods, studies on PBL and student engagement during the 2016–2025 period commonly used quasi-experimental designs, classroom action research, and mixed methods. Quasi-experimental studies were generally used to compare students' engagement before and after the implementation of PBL or between PBL classes and conventional classes. Classroom action research was often conducted by teachers to improve learning practices through cycles of planning, action, observation, and reflection. Meanwhile, mixed-method studies combined quantitative data, such as engagement scales, with qualitative data from interviews, observations, or reflections. These methods indicate that researchers attempted to capture measurable changes and classroom experiences.

Although many findings indicate the influence of PBL on engagement, several challenges remain. The implementation of PBL requires careful planning, sufficient time, suitable problems, and teachers' readiness to facilitate discussion. In some cases, not all students participate equally in group work. Some students may dominate the discussion, while others remain passive. Limited learning time, lack of resources, and students' unfamiliarity with independent learning may also affect the effectiveness of PBL. Therefore, teachers need to design clear learning procedures, assign roles within groups, monitor participation, and provide feedback.

Based on previous studies, PBL has an important role in strengthening students' engagement in learning. The model supports behavioral engagement through active participation, emotional engagement through meaningful problems, and cognitive engagement through analysis, reflection, and problem solving. However, successful implementation depends on problem design, teacher facilitation, classroom management, and students' readiness. Future research should not only examine whether PBL improves learning outcomes, but also explore how PBL shapes students' engagement in different subjects, educational levels, and learning environments. Such research is important for developing inclusive and meaningful practices.

2. Research Methods

This study employs a narrative review approach to examine the development of research on the use of Problem-Based Learning (PBL) in enhancing students' engagement from 2016 to 2025. This approach was chosen because it allows the researchers to collect, compare, and interpret various findings from previous studies in a descriptive and comprehensive manner. The data sources for this study were obtained from various open-access scientific journal databases, such as Google Scholar, ERIC, and several national and international journals that provide articles in open-access format. These sources were selected to ensure that all usable articles could be verified and accessed directly. The articles selected for this study must meet several criteria, namely: (1) published between 2016 and 2025, (2) articles, research studies, or reviews published in scientific journals, (3) discussing the use of Problem-Based Learning (PBL) in the learning process, and (4) containing a discussion of

students' engagement, whether direct or indirect. Articles not relevant to this focus were excluded from the analysis. Additionally, articles without full access, those not undergoing peer review, or those consisting solely of opinions without empirical data were also excluded from this study to ensure the quality of the sources.

Instruments

The instruments used in this study consisted of documentation sheets and data recording guidelines. The documentation sheets were used to record key information from each analysed article, such as the study title, author's name, year of publication, research objectives, methods used, and main findings related to the use of Problem-Based Learning (PBL) and students' engagement. Additionally, the researcher employed intensive reading techniques to thoroughly understand the content of the articles, ensuring that the information obtained aligns precisely with the study's focus and is not merely based on summaries. To assist the analysis process, the researcher compiled structured notes by grouping information into several main themes, such as the development of PBL research, the research methods used, and forms of students' engagement covering behavioural, emotional, and cognitive aspects. This notetaking was conducted systematically to facilitate comparisons of results across studies. In this way, the researcher could identify patterns, trends, and relationships among findings from various articles, ensuring that the analysis results well-directed and aligned with the discussion in the findings and discussion section.

Procedure

The research procedure was conducted in stages to ensure a more focused process of articles collection and selection. In the initial stage, the researcher searched for articles through several databases, such as Google Scholar and open-access journals, using keywords "Problem-Based Learning", "Students' Engagement", "Classroom Participation", and "Active Learning". From these search results, the researcher collected several articles deemed relevant. Subsequently, an initial screening was conducted by reviewing the titles abstracts to ensure the articles aligned with the study's focus specifically, the use of PBL and students' engagement. Articles that did not align with or address these two aspects were then excluded.

In the next stage, the articles that passed the initial screening were read thoroughly to gain a deeper understanding of the research content, ranging from the objectives and methods to the results obtained. During this process, the researcher noted key points related to students' engagement and the implementation of PBL. Once all the data has been collected, the articles are then grouped based on specific themes, such as the types of students' engagement (behavioural, emotional, and cognitive) and the research methods used. This grouping helps researcher identify patterns and trends emerging from various studies, making it easier to draw conclusions regarding the development of PBL research from 2016 to 2025.

Data Analysis

The data in this study were analysed using thematic analysis by examining the content of each selected article. The researcher first read and highlighted key sections related to the use of Problem-Based Learning (PBL) and students' engagement. From this process, key information such as the research objectives, methods used, and results obtained were recorded. After that, the researcher began grouping the data based on common themes, such as types of students' engagement (behavioural, emotional, and cognitive) and types of research methods, such as quasi-experimental, classroom action research, or mixed methods. This process was repeated to ensure that the data grouping was accurate and that no important information was overlooked.

After the data was grouped, the researcher then compared the results from various articles to identify emerging patterns or trends. For example, whether most studies showed an increase in students' engagement after implementing PBL, or which methods were most frequently used in those studies. The results of this analysis are then presented descriptively in narrative form to make them easier to understand. Through this approach, researcher can describe the evolution of PBL research over the years, while also demonstrating how the focus of such research has increasingly shifted toward enhancing students' engagement in the learning process.

3. Results and Discussions

This section presents the results of a review of several articles discussing the use of Problem-Based Learning (PBL) in relation to students' engagement in learning during the period from 2016 to 2025. The articles analysed were selected based on their relevance to the topic and the availability of full-text access, enabling the researcher to comprehensively understand the objectives, methods, and findings of each study. Through this analysis, the researcher identified common patterns that emerged, both in terms of the evolution of research focus, the

methods used, and the results obtained regarding students' engagement. Therefore, this section will discuss these findings in detail based on the three research questions formulated.

Research Trends of PBL and Students' Engagement (2016-2025)

Trends in Problem-Based Learning Research

Based on a review of several articles, it is evident that research on Problem-Based Learning (PBL) and students' engagement has seen a significant increase, particularly since 2020. Initially, research focused primarily on the effectiveness of PBL in improving learning outcomes; however, overtime, the focus has shifted toward students' engagement. For example, research by Kaur & O'grady, (2024) shows that the implementation of PBL in high schools can increase overall students' engagement compared to traditional methods, particularly in terms of self-directed learning and active participation in class. These findings indicate that when students are given the opportunity to learn independently through problem-solving, they engage in discussions with their peers. This creates a more dynamic classroom atmosphere because students not only receive material from the teacher but are also directly involved in the process of understanding and solving problems. Additionally, increased self-directed learning helps students' take greater responsibility for their own learning, so their engagement is evident not only through classroom participation but also through their efforts to understand the material more deeply.

In addition, a study by (Sari et al., 2022) also confirm that Problem-Based Learning is becoming an increasingly relevant approach because it connects lessons to real-world situations, thereby making students more engaged in the learning process. The research indicates that when learning is designed around contextual problems, students tend to be more active in understanding the material and participating in learning activities, whether in discussions, collaboration, or task completion. Students become more interested in finding solutions because they see what they learn is not only used in the classroom but also applied in their daily lives.

Further developments are evident in recent research that has begun to combine PBL with other approaches, such as gamification and design thinking. Research by Čubela et al., (2023) shows that integrating PBL with gamification can further enhance students' engagement by making learning more interactive and engaging. This combination makes the learning environment feel more enjoyable because students are not only focused on problem-solving but are also motivated by game elements such as challenges, points, or rewards. This can boost students' motivation to continue participating in learning activities. Additionally, the design thinking approach helps students' think more creatively when seeking solutions, making them feel more actively engaged-both in the thinking process and in collaborating with their group members. Thus, it can be concluded that PBL research trends from 2016 to 2025 indicate a shift from merely measuring learning outcomes toward a deeper understanding of how PBL influences students' engagement.

Research Methods Used in Problem-Based Learning and Students' Engagement

The Dominance of Mixed Methods and Experimental Designs

From the various articles analysed, it is evident that the most frequently used research methods are quasi-experimental designs, classroom action research (CAR), and mixed methods. For examples, Kaur & O'grady, (2024) study employed a mixed-methods approach by combining interviews, observations, and questionnaires to measure students' engagement more comprehensively. This approach yields more complete research results because data is not limited to a single perspective on students' behaviour in the classroom, while interviews help uncover students' feelings and experiences during the learning process. On the hand, questionnaires provide a general overview of the overall level of students' engagement. By combining these three methods, the results obtained become clearer and can depict the state of students' engagement more realistically.

Meanwhile, other studies, such as the one conducted by Lee, (2025), use a case study design to examine changes in students' learning outcomes and engagement after their first experience with Problem-Based Learning. This case study approach allows researcher to examine the process of change in greater depth, as it focuses not only on final outcomes but also on how students' experience the learning process from start to finish. By observing a single class or group in detail, researcher can understand how students adapt to the Problem-Based Learning model, including the challenges they face and how students' engagement evolves over time. This provides a more realistic picture of how Problem-Based Learning is applied in actual learning situations.

In addition, classroom action research (CAR) is also widely used, particularly at the school level. For example, Haque & Nurbatra, (2023) study employed a CAR approach to evaluate increases in students' participation following the implementation of Problem-Based Learning over several learning cycles. The results

of the study showed that students' engagement increased gradually, particularly in terms of asking questions, participating in discussions, and completing group tasks. This indicates that the gradual implementation of Problem-Based Learning across several cycles provides students with the opportunity to adapt to a learning approach that differs from their usual methods. Initially, there may still be students who are passive or unaccustomed to discussing, but over time they begin to feel more confident in participating. Under these conditions, the classroom atmosphere becomes more active and interactive, as nearly all students begin to engage in learning activities, whether through asking questions, discussing or completing tasks together.

This indicates that Problem-Based Learning research is evolving not only in terms of topics but also in terms of methods, as researchers strive to adopt a more comprehensive approach to understanding students' engagement.

Key Findings and Emerging Trends

Problem-Based Learning and Enhancing Students' Engagement

Nearly all the studies analysed show consistent results indicating that Problem-Based Learning has a positive impact on students' engagement. Research by Kaur & O'grady, (2024) found that students' learning through Problem-Based Learning showed improvements in classroom participation, social interaction, and independent learning skills. These findings suggest that when students are actively engaged in the learning process, they not only become more willing to participate in class but also more open to interacting with their classmates. Discussion and group work activities in Problem-Based Learning allow students to exchange opinions and collaborate, thereby improving social relationships within the classroom. Additionally, because students are required to find solutions on their own, they also begin to get used to managing their own learning, such as seeking information and understanding the material independently without relying on teacher's explanations.

Mazrur et al., (2024) reached a similar conclusion, demonstrating that Problem-Based Learning can significantly enhance students' engagement because students are more active in discussions and problem-solving. This occurs because, in Problem-Based Learning, students do not merely receive information but are directly involved in understanding and solving the problems presented to them. This discussion process helps them get used to expressing their opinions and listening to their peers' ideas, making classroom interactions livelier. Additionally, when students are given the responsibility to find solutions, they tend to be more focused and serious in their learning. This makes learning activities no longer monotonous but more dynamic, as every student's plays a role in the process.

In addition, research by Nordin et al., (2024) that integrates Problem-based Learning with design thinking shows that students' engagement increases because they feel the learning is more relevant to real life and allows room for creativity. This occurs when students view problems from various perspectives and seek creative solutions, rather than just theoretically correct answers. When students are given the freedom to innovate, they tend to be more interested and feel they have a role in the learning process. Furthermore, the connection to real life makes students more motivated to engage actively. Under these conditions, the learning process focuses not only on outcomes but also on meaningful learning experiences for students.

Challenges in Implementing Problem-Based Learning

Although many benefits have been identified, some studies have also highlighted challenges in implementing Problem-Based Learning. According to Fang et al., (2023) the main challenges in Problem-Based Learning include time constraints, teacher readiness, and the need for specialized training for facilitators, this suggests that the success of implementing Problem-Based Learning depends not only on the learning model itself but also on teacher readiness and classroom conditions. If learning time is limited, teachers may find it difficult to organize discussion and problem-solving activities to their full potential. Additionally, teachers who are not yet familiar with Problem-Based Learning may struggle to guide students, particularly in steering discussions to stay on track. Therefore, adequate training is essential so that teachers can understand their role as facilitators, ensuring that the Problem-Based Learning process runs effectively and aligns with the intended objectives.

In addition, Lee, (2025) also emphasized that the success of Problem-Based Learning depends heavily on the quality of the teacher's facilitation skills; therefore, adequate training is necessary to ensure optimal implementation. The teacher's role is no longer that of the primary source of information, but rather that of a facilitator who guides the learning process. If teachers can effectively lead discussions, ask the right probing questions, and assist students who are struggling, then learning will be more focused and effective. Conversely,

if teacher support is inadequate, students' may feel confused or lose focus while solving problems. Therefore, a teacher's ability to manage the classroom and facilitate learning is a key factor in ensuring that Problem-Based Learning truly enhance students' engagement throughout the learning process.

Future Trends in Research

Recent research indicates that the direction of Problem-Based Learning development is increasingly moving toward the integration of technology and innovative approaches. For example, a study by Atwa et al., (2024) compared Problem-Based Learning in online and face-to-face contexts and found that both approaches can be equally effective if well-designed. This indicated that the success of Problem-Based Learning is not solely determined by the format of the learning, but rather by how the activities are designed. Whether in face-to-face or online settings, if the problem is clearly defined, discussion activities are well-structured, and students' interaction is maintained, students' engagement can still be fostered. In online learning, for example, the use of discussion forums or virtual group work can replace direct interaction in the classroom. Meanwhile, in face-to-face learning, interaction can occur more spontaneously. With proper planning, both models are equally capable of creating active and meaningful learning experiences for students.

In addition, another emerging trend is the use of real-world contexts in learning to enhance students' engagement, as demonstrated by Chang et al., (2024). Linking lesson content to real-life situations closely related to daily life makes it easier for students to understand and feel that what they are learning is important. They do not just complete assignments out of a sense of obligation, but also because they are curious about how solutions to these problems can be applied in the real world. This makes students' more interested in engaging in learning, whether during discussions or while completing assignments, because they see the direct benefits of what they are learning.

Overall, the results of this study indicate that Problem-Based Learning (PBL) plays a significant role in enhancing students' engagement, in terms of participation, interaction, and engagement in the thinking process. Furthermore, the reviewed studies also demonstrate developments in the methods and innovations in the application of Problem-Based Learning. Although there are still some challenges in its implementation, Problem-Based Learning remains a relevant and promising approach for creating active and meaningful learning experiences for students'.

4. Conclusion

Based on the results of the study, it can be concluded that the use of Problem-Based Learning generally has a positive impact on students' engagement in learning. From the various studies analyzed, it is evident that students become more active participants, more willing to engage in discussions, and more involved in the thinking process when faced with problems that need to be solved. Furthermore, students' engagement is not only evident in classroom activity but also in the improvement of independent learning skills and social interaction among students. In terms of research development, studies on PBL have increased year by year and are beginning to show a more diverse direction. Research focuses not only on students' learning outcomes but also on how PBL can create more meaningful learning experiences for students. In terms methods, research on PBL frequently employs quasi-experimental approaches, classroom action research, and mixed methods. This indicates that researchers are striving to examine the impact of PBL from various perspectives, both quantitatively and qualitatively, resulting in more comprehensive findings. However, the implementation of PBL still faces several challenges, such as time constraints, teacher readiness, and the need for adequate training. Therefore, future research is expected to further explore strategies for implementing PBL that are appropriate for various learning contexts so that its benefits can be fully realized

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